Henry Skinner

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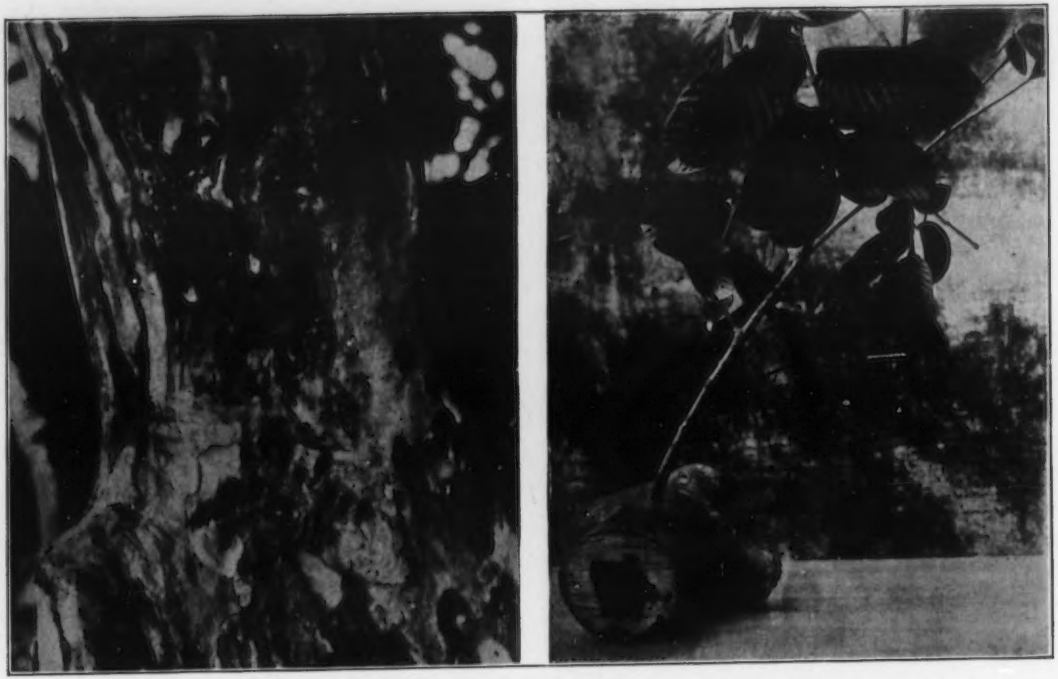

INJURY TO LIVING GUAVA TREE BY NEOTERMES CASTANEUS (BURM.)—BEQUAERT.

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CONTENTS

Bequaert—Neotermes Injurious to Living Guava Tree with Notes on other Amazonian Termites..... 289
Hungerford and Beamer—Report of Collections of Aquatic Hemiptera taken in Cherokee Co., Kan., and other New Records from the State. 295
Frost—Convergent Development in Leaf-Mining Insects..... 299
Knight—Description of a New Species of Plagiognathus from the Eastern United States (Hem., Miridae)..... 305
Hasey—A New Species of Trogus (Hym.: Ichneumonoidea)..... 306
Viereck—Recent Impressions of the British Museum..... 308
Editorial—Coleman T. Robinson..... 309
Beamer—The Overwintering of Vespula communis var. flavida Sladen (Hym. Vespidae)..... 309
Weiss—Coleoptera New to New Jersey 310
Entomological Literature..... 310
Review, A Monograph of the Plecoptera of America North of Mexico.. 314
Review—A Bibliography of the North American Hemiptera-Heteroptera. 315
Doings of Societies—The American Entomological Society: Diptera, Coleoptera, Economic, Orthoptera..... 316
Obituary—Carlo Emery..... 318
Obituary—Henry W. Wenzel..... 320

Neotermes Injurious to Living Guava Tree, with Notes on other Amazonian Termites.

By J. BEQUAERT,

Department of Tropical Medicine, Harvard University Medical School.

(Plate VIII.)

During the Third Hamilton Rice Expedition to South America, in conjunction with the Department of Tropical Medicine of Harvard Medical School, I had occasion to make a few observations on termites which may be of interest to others. The species were identified by Mr. T. E. Snyder, of the United States Bureau of Entomology. I gratefully acknowledge his help and also wish to thank him for valuable information regarding some of the habits recorded.

The trip, made from July to September, 1924, was confined to the immediate banks of the Amazon and its affluents, the Rio Negro and Rio Branco. The alluvial, central portion of the Amazon Basin, although densely wooded, is so low that much of it is covered by the flood for several weeks in succession. The highest level is said to be reached in May or June, when the forested banks are beneath 20 to 50 feet of water. The alluvial valley then forms a major bed to the river, some 20 to

ENTOMOLOGICAL NEWS, ACAD. NAT. SCI. PHILADELPHIA, PENN'A.

40 miles wide, where the water flows swiftly between the trees. Of course, these peculiar conditions have been frequently described and they are merely noted here because they explain the scarcity of termites in the part of the country which I have visited, as contrasted with their abundance in the higher-lying forest of Guiana or the grass-lands and dry woods of southern Brazil. Periodically inundated land, much of which remains swampy throughout the year, is highly unsuitable for terrestrial termites, and I have found that even arboreal species are scarce in such areas.

In places that are permanently above water—on so-called "terra firma"—termites did not impress me as particularly abundant either. Although the small number of species obtained may be largely due to lack of diligent collecting, I was struck with the absence of hilly clay-nests and arboreal termitaria of carton, which are so conspicuous a feature of the Congo forest, for example. Furthermore, in the houses, even of the smaller towns, the depredations of the termites were not by any means as spectacular as in tropical Africa and I did not notice that the inhabitants worried a great deal about them. In Manaós particularly these insects appeared to do but little damage.

I am inclined to believe that in the Amazon valley, terrestrial and arboreal termites are to a considerable extent kept in check by the formidable array of true ants (Formicidae). That keen observer of Amazonian life, Richard Spruce, noted that ants "deserve to be considered the actual owners of the Amazon valley, far more than either the red or the white man." (Notes of a Botanist on the Amazons and Andes, II, 1908, p. 366). The leaf-cutting and fungus-growing attine ants seem to be everywhere, and termites with a similar diet could hardly hope to compete with them. It is not surprising, therefore, that fungus-growing termites, which are extremely abundant in the Old World tropics, are not known with certainty from America. In addition, South America possesses very many species of large and aggressive ecitonine and ponerine ants, almost wholly restricted to carnivorous food and for which termites are a particularly welcome and defenceless prey. An excellent ac-

ENTOMOLOGICAL NEWS
ACAD. NAT. SCI.
PHILADELPHIA, PENN'A.

count of ants as enemies of termites has been given by E. Hegh (Les Termites, 1922, pp. 573-586).

KALOTERMITIDAE.

Neotermes castaneus (Burmeister). On August 7th, I noticed in the garden of Dr. H. W. Thomas' laboratory, at Manaós, a guava tree *(Psidium guayava* Raddi; "goiabeira" of the Brazilians), which on one side of the main trunk, some four to six feet above the ground, presented many irregular holes. Although plugged up with dark grayish dirt, these holes seemed to exude sap. When opened they led through the healthy bark and cambium into narrow galleries gnawed in the live wood. It was at first thought that the tree was attacked by wood-boring beetle larvae, until at one of the holes appeared the head of a termite, which, when I attempted to capture it with a forceps, retreated at once in the trunk of the tree. When a hole was opened, a termite would soon appear, back up to the entrance, and void from the tip of the abdomen excremential matter which rapidly hardened into a gray, earthen-like substance. By sawing off one of the limbs of the tree, many larvae, nymphs and winged adults of *Neotermes castaneus* were obtained; but soldiers were much less numerous.[1] The central portion or heart-wood of the limb was honeycombed with wide galleries, burrowed in the hard and apparently sound wood (Fig. 1). The galleries extended far up the tree, into branches which were but 2 inches thick. The largest of the cavities were partly filled with moist, decaying, dark brown wood-pulp. The internal labyrinth connected with the openings in the bark by means of horizontal and fairly straight channels. These entrances help in the ventilation of the nest and serve to evacuate some of the material removed by the gnawing of the galleries, the wood first passing through the digestive tract of the workers. They are found on the main trunk and larger limbs only and all crowded together on one side, facing the northeast on the main trunk and placed on the under side of the limbs. All the activities of the termites are carried on inside the trees and the

[1] The Kalotermitidae differ from the other termites in having no worker caste differentiated as such. The larvae function as workers, but eventually develop into nymphs, which give males and females.

insects do not build covered passageways on the outside of the trunk.

The guava tree appeared to be in a sickly condition, though still well alive. Even on some of the limbs that were completely honeycombed in the center, the smaller branches were still

Fig. 1. Three cross-sections and a longitudinal section of living guava limbs, honeycombed by *Neotermes castaneus* (Burmeister). The longitudinal section illustrates the progress of the galleries in the sound wood. One-half of natural size.

covered with leaves, as shown in one of the photographs (Plate VIII). I am inclined to believe that the labyrinth of internal galleries forming the nest of the termites was but little injurious to the plant, since it nowhere approached the sapwood, cambium and bark. The damage was probably chiefly due to the many holes drilled through the outer layers of the stem.

So far as known the diet of termites is exclusively vegetarian. Yet they but seldom attack living tissues of plants and the few recorded cases all refer to Kalotermitidae. The majority of the

members of that family, however, still prefer dead, dry, or decaying wood. *Kalotermes militaris* Desneux attacks the tea-trees in Ceylon in exactly the same fashion as *Neotermes castaneus* does with the guava tree (see E. Hegh, Les Termites, 1922, p. 46, footnote) and several other species of that genus are known to gnaw galleries in living wood (E. Hegh, *op. cit.*, pp. 339-344). No such observations have as yet been published on *Neotermes castaneus,* but Mr. Snyder informs me that he found it "infesting living red mangrove trees in a swamp at Miami Beach, Florida, in 1916, 1917, and 1918. Both roots (above ground) and trunk were attacked and the termites burrowed through living cambium."

The intestinal tract of the larvae of *Neotermes castaneus,* examined by Dr. R. P. Strong, Mr. Ralph Wheeler, and myself at Manaós, revealed several species of Protozoa in great abundance. Spirochaetes were represented by at least two types (see R. P. Strong, Science, LXI, 1925, p. 103). Of flagellates there were large trichonymphids, most easily observed in the drops of fecal matter, which the workers void when even slightly disturbed; also a much smaller, bi-flagellate form. The wall of the intestine was lined with a gregarinid, apparently of the genus *Stylocephalus (Stylorhynchus),* provided with a long, snout-like appendage or epimerite, fixed in the epithelium. This parasite is perhaps as yet undescribed. The only gregarinid reported from termites is *"Gregarina" termitis* Leidy, which is very superficially known (see Minnie Watson Kamm, Illinois Biolog. Monogr., VII, 1, 1922 p. 56), and may have been based upon sporonts of a *Stylocephalus.*

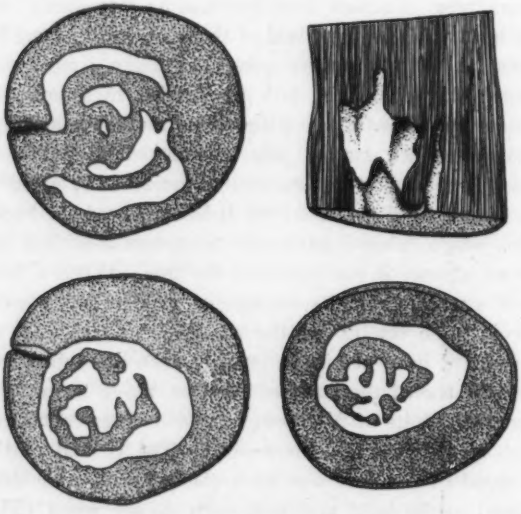
RHINOTERMITIDAE.

Leucotermes tenuis (Hagen). A few workers and soldiers of this small species were found among decaying grass under stones, in a waste place at Manaós. They are probably the termites which in the Amazon valley most commonly do damage in human habitations.

Rhinotermes nasutus (Perty). A small colony, with workers and soldiers, was observed in a decaying tree stump,

insects do not build covered passageways on the outside of the trunk.

The guava tree appeared to be in a sickly condition, though still well alive. Even on some of the limbs that were completely honeycombed in the center, the smaller branches were still



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Rhinotermes nasutus (Perty). A small colony, with workers and soldiers, was observed in a decaying tree stump,

near the edge of a forest clearing at San Alberto, at the mouth of the Rio Branco.

TERMITIDAE.

Syntermes grandis (Rambur) and *Syntermes brasiliensis* Holmgren. Both these large species of termites were observed at Vista Alegre, on the Rio Branco, September 6th. They were foraging in broad daylight and sunny weather, between 9 and 10 A. M. The soldiers and workers had spread over the soil, but not in very large numbers, and were busily engaged in collecting stalks and leaves of grasses and other low plants. The two species, of which *S. grandis* is much larger, were working but a short distance apart, although on quite distinct areas. In each case the termites carried their burdens into a number of large openings leading into deep vertical channels in the sandy soil. The nest itself could not be reached.

I also observed a column of the large ponerine ant, *Neoponera commutata* (Roger) (identified by Prof. W. M. Wheeler), preying upon these termites, apparently attacking the workers only, of which they carried off many individuals. Soon after the ants appeared on the scene, the termites withdrew completely under the ground.

The *Syntermes* were only found in the savanna country—so called campos—which cover much of the Upper Rio Branco basin, as far south as Vista Alegre.

The foraging habits of certain Old World termites have been described by several observers, beginning with Koenig, in 1779, and Smeathman, in 1781. Some of these species are known to work in broad daylight (see E. Hegh, Les Termites, 1922, pp. 225-261). But little seems to have been published concerning similar habits in South American termites. Mr. T. E. Snyder informs me that Dr. W. M. Mann collected two species of *Syntermes* on the Mulford Expedition to Brazil and Bolivia, with some date on foraging.

EXPLANATION OF PLATE VIII.

Injury to living guava tree by *Neotermes castaneus* (Burmeister). Cross-section of a limb (right) and surface of the bark, showing the holes leading into the galleries (left).

Report of Collections of Aquatic Hemiptera taken in Cherokee County, Kansas, and other New Rew Records from the State.

By H. B. HUNGERFORD and R. H. BEAMER, University of Kansas, Lawrence, Kansas.

(Continued from page 266.)

HYDROMETRIDAE.

Hydrometra martini Kirk. This species was reported for Kansas several years ago by the senior author. We took several specimens at Topeka, Kansas, May 26th, 1923, and on October 8th at Rock Pool, east of Lawrence, Kansas, we found the species very abundant. We brought in 135 specimens, but left most of them at the pool. Fully winged forms are quite common in this lot. The senior author has taken great numbers of this species about Douglas Lake, Michigan, and at various places in Minnesota. Neither of these places are mentioned in Van Duzee's Catalogue. Dr. R. F. Hussey reported the species from Michigan. This species was taken in Morton County, Kansas, by Mr. Clarence O. Bare and by Mrs. Grace Wiley in Colorado County, Texas.

Hydrometra australis Say. This species is not as common nor as wide spread as the preceding. From Cherokee County we got 18 males and 7 females on August 15 and 16, 1920. Mr. Beamer got one female from the same locality in December, 1920. Other Kansas records are:

R. H. Beamer, Chautauqua County, 1916, Leavenworth County, July 1, 1924, and Atchison County, July 11, 1924; J. B. Norton, Riley County, August and September; H. B. Hungerford, Douglas County, at Rock Creek, July, 1922; and E. P. Breakey, Leavenworth County, July 1, 1924.

These two species are about the same size and general appearance, but the following table to the North American species taken from the *Canadian Entomologist* for March, 1923, will enable the collector to identify his catch.

A. Pits on side above middle coxa numerous and irregularly placed; length more than 13 mm. (13½ to 15½ mm.) ..... *H. wileyi* Hungerford.

AA. Pits on side above middle coxa seldom more than four; length less tran 12 mm. (8 to 11 mm.)

B. Pits on side above middle coxa normally two. Two thin plate-like elevations on under side of sixth segment in male ..... *H. martini* Kirk.

BB. Pits on side above the middle coxa normally four; Two conical elevations on underside of sixth segment in male ..... *H. australis* Say.

MESOVELIIDAE.

Mesovelia bisignata Uhler (= *M. mulsanti* White?) is common in Kansas and is wide-spread over the United States. It is in our collections from Texas, Michigan, Minnesota and New York. For a long time this has been the only representative of the family known in the United States, but recently the senior writer has described two beautiful little species from Michigan.*

VELIIDAE.

Of the four genera in the United States three are represented in Kansas—*Velia, Rhagovelia* and *Microvelia*. The junior author secured a single specimen of *Velia watsoni* Drake in Cherokee County, Kansas. This slender little species was described from Florida. *Rhagovelia rivale* Bueno, recently described, was collected by the senior author in Douglas County, Kansas. The genus *Microvelia* is represented throughout the state. It must be stated here that the colored drawing on Color Plate III, Figure 7, of the senior author's "Biology and Ecology of Aquatic and Semi-aquatic Hemiptera," *University of Kansas Science Bulletin*, Volume XI, is not *Microvelia borealis* Bueno but *Microvelia hinei* Drake. The latter species was undescribed at the time Mr. Bueno determined the species from which the drawing was made. This clears up a point in question concerning the number of molts (see page 139 of above bulletin). This little Kansas species goes through five nymphal stages. Bueno reported four for *M. borealis*.

OCHTERIDAE.

This family contains but three species for the United States

* See Annals of Entomological Society of America, Vol. XVII, pp. 453-456.

and we have in our collections no specimens taken from Kansas. Dr. Carl J. Drake has in his collection a female *Ochterus americanus* (Uhler) from Kansas and we give it here as a new record for the state.

GERRIDAE.

Metrobates hesperius Uhler was taken by us August 15, 1920, in Cherokee County, Kansas, and by the senior author at Dykeman's Bridge, Douglas County, Kansas, in July, 1922.

NAUCORIDAE.

We did not take any species of this family in Cherokee County, Kansas. Mr. Beamer got *Pelocoris carolinensis* Bueno at Coldwater, Kansas, in July, 1916. On September 7 and 8, 1923, Mr. Clarence O. Bare brought in from the same pool 68 specimens, all but seven of which were adult.

NOTONECTIDAE.

Genus *Notonecta: Notonecta undulata* Say is common all over the state and *Notonecta variabilis* Fieb. is recorded in Van Duzee as occurring in Kansas. All of the specimens labeled as *N. variabilis* Fieb. in collections of Kansas insects have been pale specimens of *N. undulata* Say. In December, 1922, the junior author took several very small specimens that run down to *N. raleighii* Bueno and have structural details like *N. variabilis* Fieb., but not like *N. undulata* Say. In Rock Creek in Cherokee County, three miles south east of Columbus, Kansas, we took a single specimen of *Notonecta irrorata* Uhl., a new record for the state. Most diligent search for more specimens of this beautiful species failed. One of our students, Jean Linsdale, recently collected a specimen in Doniphan County, Kansas.

Genus *Buenoa:* We took a considerable series of the *Buenoa margaritacea* Bueno group which possesses the large scutellum. Mr. Bueno has placed these in two species. The larger ones he calls *B. margaritacea* and the smaller ones *B. platycnemis* (Fieb.). *Buenoa elegans* (Fieb.), which is much smaller and has a small scutellum, was taken by us in Cherokee County and has been reported by Mr. Bueno. We find this species quite abundant in two ponds about Lawrence.

Genus *Plea:* We did not secure any specimens of *Plea striola* Fieb. Mr. Beamer got a series in a pool near Coldwater, Kansas, in 1916. Mr. Beamer and Dr. P. B. Lawson collected 9 specimens in a pool six miles east of Yates Center, Woodson County, Kansas, July 30, 1924.

NEPIDAE.

In Larson's pond, which is a half mile south east of Columbus, Kansas, we took a long series of *Ranatra,* the first the writers had ever taken in the state. Larson's pond is a spring-fed pond, an acre or two in extent. Pond lilies and *Sagittaria* are common and cattails grow at the upper end. Much of our Cherokee County material came from this fine pond. Here we took *Ranatra kirkaldyi* Bueno and *Ranatra nigra* H. S. (= *R. protensa* Mont.). In December, 1922, the junior writer visited this pond and secured a single specimen of *R. nigra* H. S., but in a small creek just 75 yards away he collected a long series of *Ranatra* including the following species: *R. kirkaldyi* Bueno, *R. fusca* P. B. (= *R. americana* Mont.), *R. nigra* H. S. (= *R. protensa* Mont.) and *R. australis* Hungerford. This is a remarkable record. Four species of *Ranatra* in one day's collecting is an unusual catch! The first record for *Ranatra* in Kansas was in Popenoe's 1883-84 list—*R. quadridentata* Stal. (this is *R. fusca* P. B. probably). On a recent field trip, October 22, 1923, to a pond near Lawrence, Kansas, the writers secured a long series of *R. fusca* P. B. The junior author took 14 specimens from a single tumble weed that had lodged in the water near the shore. A single specimen of *R. nigra* H. S. was taken on this date. On December 28th, 1923, the junior author visited the collecting place in Cherokee County again and secured seventy-two *Ranatra* from the creek. They belong to three species as follows: 2 *Ranatra australis* Hungerford (1 male and 1 female); 8 *Ranatra nigra* H. S. (2 males and 6 females); 64 *Ranatra kirkaldyi* Bueno (25 males and 39 females).

BELOSTOMATIDAE.

In our Cherokee collecting we took *Belostoma flumineum* Say. On December 27th, 1922, Mr. Beamer brought back

from that country a considerable series of *Belostoma*. These appear to belong to two species, the smaller of which we call *Belostoma flumineum* Say and the larger one we have sent to Mr. J. R. de la Torre-Bueno for study. This larger form is broader across the abdomen and in lateral view the head is seen to extend farther before the eyes than in *B. flumineum* Say. Mr. Beamer's December collection has 40 of the large form, both sexes, and 32 of *B. flumineum* Say, both sexes. On December 28th, 1923, Mr. Beamer secured from the same place 6 specimens of the large species and 3 specimens of *Belostoma flumineum* Say. The larger species has been determined for us by Mr. J. R. de la Torre-Bueno as *Belostoma lutearum* Stal.

Convergent Development in Leaf-Mining Insects.

By S. W. FROST, Pennsylvania State College.

All leaf-mining insects, by their nature, living between the two epidermal layers of a leaf, are subject to similar modifications for their life processes. The laying of eggs, the getting of food, the disposal of waste material and the provision for transformation are life habits to which all must adapt themselves, in their peculiar manner of living. Extreme modification and specialization have been made in all lines but none are perhaps peculiar to leaf-mining except the getting of food and the disposal of waste material. These two become problems to all boring and leaf-mining insects. It is not strange therefore that we find noteworthy parallelisms in the development of the mining habit in the different orders of insects.

The leaf-mining habit naturally developed independently in the various orders and no doubt has arisen several times in the different orders, unless it be the Hymenoptera where we find a homogeneous group of species differing little in their habits except in a few individual cases. In the Coleoptera there is evidence that the mining habit has arisen at least three times; the Buprestidae present a highly specialized type while the Curculionidae and the Chrysomelidae represent more primitive forms. In the Lepidoptera and the Diptera there is strong evidence that the habit has arisen independently many different times.

Taking for granted, therefore, that the mining habit has arisen independently in the four orders, it is interesting to trace the development of parallel habits in these orders. These habits are centered about the principal life processes of the insects and are summarized in the following table.

A SUMMARY OF THE HABITS OF LEAF-MINING INSECTS.

	LAYING OF		GETTING OF FOOD.					
	Eggs.		Larvae.					
Orders.	Laid within leaves.	Laid on leaves.	Sap feeders.	Parenchyma feeders.	Enter new leaves.	Feed after mining.	Blotch miners.	Linear miners.
Hymenoptera ...	some	some	none	all	some	none	all	none
Lepidoptera	some	some	some	some	some	some	some	some
Coleoptera	some	some	none	all	none	none	some	some
Diptera	some	some	none	all	some	none	some	some

	GETTING OF FOOD.			DISPOSAL OF WASTE.			TRANSFORMATION.	
	Larvae.		Adults.					
Orders.	Digitate miners.	Tentiform miners.	Feed on Leaves.	Frass ejected.	Frass in a line.	Frass scattered.	Pupa in leaves.	Cocoon cut fr. leaves.
Hymenoptera ...	none	none	none	some	none	some	some	some
Lepidoptera	some	some	none	some	some	some	some	some
Coleoptera	none	none	all	none	none	all	some	none
Diptera	one	none	some	none	some	some	some	none

The Laying of Eggs.

It makes little difference to a leaf-mining insect whether the eggs are laid upon or within the tissues of the host. In the one case, the female is provided with a specialized ovipositor adapted for piercing the leaf and inserting the eggs within the tissues of the plant, in the other case, the young larva is provided with saw-like mouth hooks or mandibles suitable for gaining an entrance into the interior of the leaf. The development of both methods can be traced through the four leaf-mining orders.

The manner in which the leaf-mining Diptera gain entrance to their host, has been discussed by the writer in a previous paper*. The Trypetidae and Agromyzidae have ovipositors which are more or less elongated, highly chitinized and suited for piercing the leaf and inserting the egg within the host. In

*Frost, S. W. Cornell Agric. Exp. Sta. Memoir 78, 1924.

Phytomyza varipes Meig., a European species, the ovipositor is as long as the remainder of the abdomen, a remarkable development for this group. In the Anthomyiidae, however, the ovipositor is generalized, membranous and telescoped within the fifth abdominal segment and is not suited for puncturing the leaf. To compensate for this deficiency, the larva of the first instar has highly developed saw-like mandibular sclerites which permit it to readily gain entrance to the host.

In the mining Lepidoptera, both types of ovipositors are found. The species laying eggs on the surface of the leaf are represented by forms such as the Micropterygidae. These are very primitive Lepidoptera and exhibit the extreme lack of ability, on the part of the female to insert her eggs within the tissues of the plant. The tip of the abdomen is generalized, ending in two retractile segments without the trace of an ovipositor. The other extreme is found in *Eriocrania* and *Incurvaria,* species which insert their eggs within the tissues of the host. In these the abdomen of the female terminates in a horny, piercing ovipositor with powerful mucles.

In the Coleoptera, we likewise find both habits developed. Probably all the Buprestidae and Chrysomelidae lay their eggs upon the surface of the leaf, while the Curculionidae, as far as the writer knows, insert their eggs within the tissues of the host.

The type of ovipositor, adapted for inserting eggs within the tissues, reaches its highest development in the Hymenoptera. The saw-like ovipositor of the Tenthredinidae is a well known and most efficient instrument for this purpose. While most American writers believe that all of the Tenthredinidae insert their eggs within the leaves, Cameron (1882)* and other European workers state that some of the species lay their eggs upon the surface of the leaves.

The Getting of Food.

Certain remarkable habits, associated with the getting of food, have arisen in the leaf-mining insects. Some species have developed the faculty of entering fresh leaves when their

* Cameron, P. British Phytophagous Hymenoptera, 1882.

food supply is exhausted. This habit is highly developed in the Diptera and occurs only occasionally in the Lepidoptera and the Hymenoptera. The Lepidoptera and the Hymenoptera feed for a large part on the leaves of woody plants which do not wilt as readily as do the leaves of herbaceous plants. They probably found it unnecessary to enter fresh leaves and consequently this habit has developed only to a slight extent in these orders. A few Lepidoptera of the genera *Acrocercops*, *Argyresthia* and *Scythris* have developed the habit of entering fresh leaves.

None of the leaf-mining orders present such diversity of larval feeding habits as the Lepidoptera. They are, for a large part, peculiar to this order and are too numerous for detailed discussion here. The sap-feeding habit of the order has resulted in great modifications of the head, labrum and mandibles. The habit of many larvae mining when young, later feeding externally or boring in stems or bark, is singular in the Lepidoptera. The type of mine properly enters in a discussion of food getting, as the mine indicates the manner in which the larva feeds. The types of mines are numerous but of no interest in this discussion. The persistance of certain types throughout the four leaf-mining orders is, however, worth noting. The blotch type is common to all orders. It is the only type that exists in the Hymenoptera with the exception of small linear mines made by the young larvae which later change to blotch mines. The digitate mine is common in certain Lepidoptera, as *Parectopa*, *Epinotia* and *Gracilaria* and occurs at least once in the Diptera. *Scaptomyza adusta* Loew., makes a very pretty digitate mine on the leaves of the Cruciferae. Tentiform mines are peculiar to the Lepidoptera where considerable silk is spun within the mine. Certain Hymenoptera and Coleoptera make vaulted, inflated or puffed mines but none produce true tentiform mines. The snail trace mines produced by *Phyllocnistis* are closely approximated by certain Diptera. *Agromyza laterella* Zett., makes a very shallow, silvery mine on Iris that resembles a snail-trace. A few other Diptera have similar habits.

The Disposal of Frass.

In insects, a wide range of habits exist in connection with the disposal of frass. The removal of the waste material is almost as necessary as the getting of fresh food. Some larvae feed on highly concentrated foods and do not void their waste until the last molt, while a few do not produce any excrement at all. Many void pellets, using these for some useful purpose as the construction of feeding cases or pupal chambers. Still others discard their frass as useless or as obnoxious. The majority of the leaf-mining larvae belong to the latter class although a few Lepidoptera mine, then construct cases of their frass.

The leaf-mining larvae, in their limited quarters, have developed unique methods of disposing of, or avoiding their frass. A few forms, especially in the Diptera, have acquired a sort of immunity and seem to be able to exist in its midst with little or no discomfort. A glance at the common dock leaf-miner, *Pegomyia calyptrata* Zett., will impress one with this fact.

One of the simplest methods larvae have adopted to avoid their frass is the abandoning of old mines and entering fresh leaves. This method, however, has developed only occasionally in the Diptera, Lepidoptera and Hymenoptera and not at all in the Coleoptera. As pointed out before, this habit probably originated in an attempt on the part of the larva to secure fresh food, rather than to avoid its excrement.

The scattering of the frass in various manners has been developed throughout the orders. The simplest form is the grouping of the frass in small piles between the larger veins of the leaf, or in unoccupied parts of the mine. This is the typical method of avoiding the frass among the Hymenoptera and the Coleoptera. A higher development of this method is the arrangement of the frass in a single or a double line through the center of the mine. In such cases the larva progresses in a forward direction, leaving its frass behind. These so called linear or serpentine mines occur commonly in *Nepticula* and *Bucculatrix*. They also occur in certain Diptera and present a peculiar arrangement in *Phytomyza obscurella* var. *nigritella* Zett. Here the frass occurs in a distinct dotted line through

the center of the mine. In some Lepidoptera the turning of the body from one side of the mine to the other, often deposits the frass pellets in neat concentric arcs at the edges of the mine.

The form of the mine may also aid the larva in avoiding its frass. In the digitate mines of certain Lepidoptera as *Parectopa* and in a few Diptera, the frass is voided in fingerlike processes which leaves the center of the mine clean for the larva. In a similar fashion, some Lepidoptera as well as Diptera, deposit their frass in the center of the mine and feed about the edges. The vaulted mines of the Lepidoptera and the bladder-like mines of the Coleoptera and Hymenoptera, make it possible for the larva to feed without coming in contact with its frass. This method of frass disposal reaches its highest development in the species of *Lithocolletis*.

The ejection of frass is a comparatively simple process in leaf-mining insects and does not involve such highly specialized structures as the anal comb of certain external feeders. The larva cuts a slit or a circular hole through the mine through which the frass is expelled. Such methods of frass disposal are common in the Lepidoptera occurring in the Tischeriidae and the Cosmopterygidae. The writer has noticed this habit in *Lyonetia speculella* Clem., which frequently mines the leaves of apple. The larva pushes its frass from a slit on the under side of the mine. It issues in a series of pellets which are at first linked together but later become massed.

Preparation for Transformation.

The leaf-mining larvae, imprisoned within their mines, have the choice of transforming within their mines or making an exit and seeking a transformation place elsewhere. In either case a cocoon may or may not be constructed. Certain Buprestidae, for example, pupate within their mines without the formation of cocoons. These pupae rattle within the leaf, like seeds in a pod. The puparia of the Diptera are often formed within the mines but these are fastened to one of the surfaces of the mine. Many of the Lepidoptera and certain of the Hymenoptera as *Phyllotoma*, and certain Coleoptera, as *Pachyschelus* and *Orchestes*, pupate in their mines but construct

silken cocoons. Still others have gone a step further and cut a case from the mine including the cocoon. This occurs in *Phyllotoma* (Hymenoptera) and *Coptodisca* and *Antispila* (Lepidoptera). Still others make an exit through a hole in the leaf and fall to the ground where they may or may not form cocoons.

Description of a New Species of Plagiognathus from the Eastern United States (Hem., Miridae.)*

By HARRY H. KNIGHT, Ames, Iowa.

Plagiognathus ilicis new species.

Distinguished from all described species by the short rostrum and pale tibiae with brownish spines; color nearest that of *blatchleyi* var. *nubilus* Kngt., but scutellum fuscous and size smaller. Distinguished from *Microphylellus* by the pubescence, shorter head, and more robust form of body.

♂. Length 3.4 mm., width 1.5 mm. Head: width .77 mm., vertex .37 mm.; shorter and more vertical than *obscurus* Uhler. Rostrum, length 1.07 mm., just attaining posterior margins of intermediate coxae, yellowish, apex blackish. Antennae: segment I, length .20 mm.; II, .95 mm.; III, .53 mm.; IV, .31 mm.; greenish yellow, apical half of segment II becoming dusky, last two segments brownish to fuscous. Pronotum: length .63, width at base 1.21 mm.

General coloration yellowish to greenish yellow, anterior and narrow lateral margins of pronotal disk more greenish, basal half of disk fusco-brownish; scutellum fuscous, narrow base and mesoscutum yellow; hemelytra pale yellowish translucent, apical half of corium and embolium pale fuscous to fuscous, apical half of clavus pale fuscous; cuneus yellowish translucent, inner basal angle pale translucent; membrane uniformly light fusco-brownish, nearly clear bordering apex of cuneus, veins nearly concolorous with membrane. Clothed with simple, rather soft, yellowish to golden brown pubescence, becoming fusco-brownish on dark apical area of corium. Ventral surface yellowish to greenish yellow, xyphus pale green. Legs rather uniformly pale yellowish, femora rather obscurely dotted with small, pale fuscous spots; tibiae pale, impunctate, spines yellowish brown, with barely a trace of brownish at base of spines; tarsi pale yellowish, clavus brown. Genitalia distinctive of the species, right clasper and the later-

* Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

ally directed apex of aedeagus very similar to *obscurus* Uhler, but the left clasper broadly projecting laterally, the dorsal surface broadly sulcate and loosely clasping the tip of aedeagus.

♀. Length 3.7 mm., width 1.53 mm. Head: width .77 mm., vertex .41 mm. Antennae: segment II, length .88 mm. Pronotum: length .71 mm., width at base 1.38 mm. More robust than the male and lighter colored; dorsum rather uniformly yellowish, hemelytra paler and sub-translucent, scutellum and a cloud on apical area of corium fusco-brownish; membrane and veins uniformly pale.

Holotype: ♂ July 13, 1920, Ringwood, near Ithaca, New York (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* a good series taken with the types on *Ilex verticillata* found growing in the bog at Ringwood near Ithaca; specimens deposited in the Cornell University collection, U. S. National Museum collection, and the Iowa State College collection.

In some respects this species is intermediate between *Plagiognathus* and *Microphylellus,* while the left genital clasper is of a form quite different from either genus. The general form, color and pubescence is that of *Plagiognathus* while the tibial characters approach *Microphylellus;* the yellowish brown spines with brownish at base of each which scarcely forms distinct spots, may cause some difficulty in tracing *ilicis* through the generic key.

A New Species of Trogus (Hym.: Ichneumonoidea).

By W. H. Hasey, B.S.*

Trogus nigrocinctus n. sp.

Holotype: One male specimen collected by J. H. Comstock and now in the collection at Cornell University.

Head: Entirely black. Clypeus flat: lateral edges but slightly

* Contribution from the Entomological Laboratory of the Massachusetts Agricultural College.

An extract from a paper on the Species of *Trogus* of America North of Mexico, presented as a thesis for the degree of Master of Science by Mr. Hasey. Mr. Hasey lost his life in the war, and his thesis has never been published as a whole. This extract is given in connection with the publication of the New York State List of Insects.—H. T. Fernald.

sunken: lower margin straight with a small knob-like protuberance in the middle: lower half sparsely coarsely punctured: upper portion more finely and closely punctate: clothed with short, semi-decumbent, black hairs. Frons smooth and shiny and deeply concave around antennal pits: sparsely coarsely punctured above and slightly convex in the middle: downward projections flat. Vertex rather closely and coarsely punctured and clothed with short semi-decumbent hairs. Cheeks broad and buccate: rather closely, coarsely punctured and clothed with short semi-decumbent hairs. Labrum reddish brown: rather strongly exserted but quite narrow: rather closely punctured with a row of long brownish bristle-like hairs on the lower margin. Mandibles black: dusky ferruginous, smooth and shiny at the tips, coarsely punctured in the middle and finely punctured at the base. Antennae fulvous: dusky at tips: scape black with paler spot at base: middle segments slightly serrate: with 18 patch-like sense organs.

Thorax.—Entirely black. Pronotum rather sparsely coarsely punctured and clothed with short semi-decumbent, black hairs: pronotal ridge distinct, as is also the groove lying behind, which is smooth and shiny in the center. Propleuron with a prominent median ridge dividing the plate into the two typical areas.

Mesonotum broadly rounded: slightly convex at anterior center: closely finely punctured and clothed with very short semi-decumbent hairs. Scutellum quite strongly raised and rounded: entire surface covered with sparse, rather fine punctures and erect black hairs. Mesopleuron sparsely coarsely punctured above and rugose below: mesopleural pit shallow with a prominent raised smooth and shiny area above: gutter-like groove near posterior margin distinct with prominent parallel transverse ridges.

Median area of postscutellum strongly raised, closely finely punctured and clothed with short, erect hairs: lateral grooves shiny and quite deep, with but mere traces of cross ridges. Metapleuron coarsely punctate and slightly rugose: clothed with erect black hairs: median ridge wanting.

Propodeum strongly raised anteriorly: apical area very small, smooth and shiny: lateral margins diverging to a point near the apex, then converging to the base of the petiole: median, lateral and marginal areas deeply rugose or sculptured: clothed with erect, black hairs: spiracles long and linear.

Abdomen.—Fulvous except the base of the petiole and a narrow band at the base of the three following segments, black.

Petiole strongly raised to a point before apex: segments not constricted at the base: dorsal surface finely punctured and clothed with short, decumbent, yellowish hairs: ventral surface flat, closely, finely punctured and clothed with a few scattered, short hairs: spiracles oval: gastrocoeli prominent on second segment.

Wings.—Dusky fuliginous with an aeneous reflection: veins almost black.

Legs.—Black: tibiae and tarsi brownish: lighter beneath especially on fore legs: very sparsely coarsely punctured and clothed with short, semi-decumbent hairs: tibiae armed with short scattered bristles.

Habitat: New York.

The above description was prepared from a single male specimen, the type.

This species is apparently very rare. The only specimen seen was captured in September, 1885, by J. H. Comstock. It is readily distinguished by the narrow, black bands at the base of the second, third and fourth dorsal abdominal segments.

Recent Impressions of The British Museum.

During my recent visit to the entomological section of the British Museum, I had the pleasure to be welcomed and aided by Dr. Gahan, who has charge of Entomology, Dr. Waterston, who is in charge of the Hymenoptera, Mr. Hartley Durrant and Mr. W. H. T. Tams. Dr. Guy Marshall, who is Director of the Imperial Bureau of Entomology and of the Insecta part of *The Zoological Record*, has his office in the Entomological Section in the Museum; consequently I enjoyed the kind attention of Dr. Marshall.

I was deeply impressed with the wealth of material available in the Museum and with the efficient way in which that material is being preserved and studied. Dr. Gahan and his colleagues are imbued with the ambition to reveal to the world the details of the historic treasures in their Museum and as a result of their published work and their future work I feel sure that many of our difficulties in identifying old genera and species will disappear.

I look forward to the time when I will again visit England.

HENRY L. VIERECK, Ottawa, Canada.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., DECEMBER, 1925.

Coleman T. Robinson.

(See cover of NEWS.)

Coleman T. Robinson was born in Putnam County, New York, 1838. He was a stockbroker in New York City and amassed a large fortune. He was greatly interested in the lepidoptera and actively pursued this avocation while engaged in business. He wrote some excellent papers[1] and among them a valuable article on the North American Tortricidae, with six lithographic plates containing eighty-six illustrations. It was his intention to figure in color as many species as possible but this was prevented by his early death. In conjunction with Augustus R. Grote he published five papers of "Descriptions of North American Lepidoptera" in the *Transactions of The American Entomological Society,* with one hundred illustrations.

He travelled extensively abroad and also spent some time at the University of Berlin. He was elected a Corresponding Member of The American Entomological Society on February 13, 1865, and served as President in 1869.

He will always be remembered by the students of the American Bombycidae, Sphingidae, Noctuidae and Tortricidae. He died May 1, 1872, at the early age of 35. His early decease probably lost to entomology a great patron of the study. He willed to the Buffalo Society of Natural History the sum of ten thousand dollars.

H. S.

The Overwintering of Vespula communis var. flavida Sladen (Hym.: Vespidae).

Six female specimens of *Vespula communis* var. *flavida* Sladen were found in December, 1923, overwintering in curled-up elm leaves. The individuals had crawled into the chambers made by the curling of the leaves and were thus found while the writer was searching for hibernating grape leaf hoppers. It

[1] See Canadian Entomologist, 1872, IV, pages 109 and 118.

was not the peculiar situation in which these wasps were found to which the writer desires to call attention, but the very unique manner in which they were taking care of their wings. These were folded longitudinally, as is natural, but instead of lying, as one would expect, on the back of the individual, they were tucked away very neatly on the under side of the abdomen and carefully held in place there by the last pair of legs. This rather unusual way of caring for the organs of flight, which are so necessary to these overwintering queens in order that they may properly build their nests, feed themselves and their young, and thus perpetuate their kind, was new and interesting to the writer and this opportunity is taken to record the observation.

Thanks are due Mr. S. A. Rohwer of the United States National Museum for identifying these wasps. Two of the specimens are deposited at the U. S. N. M. and the others are in the collections at the University of Kansas.

R. H. BEAMER, University of Kansas.

Coleoptera New to New Jersey.

Mr. C. A. Frost recently identified for me, two species of beetles that do not appear to be recorded from New Jersey. One is a staphylinid; *Philonthus varians* Payk., collected at Seaside Park, N. J., May 29 and mentioned in Smith's "List of the Insects of New Jersey," but without locality. The other is a nitidulid, *Brachypterus cinereus*, Heer., collected at Seaside Park, N. J., May 29. Both are European.

HARRY B. WEISS, New Brunswick, New Jersey.

Entomological Literature

COMPILED BY E. T. CRESSON, JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The numbers in Heavy-Faced Type refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

Papers of systematic nature will be found in the paragraph beginning with (N). Those pertaining to Neotropical species only will be found in paragraphs beginning with (S). Those containing descriptions of new forms are preceded by an *.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Papers published in the Entomological News are not listed.

4—Canadian Entomologist. 6—Journal, New York Ent. Soc. 7—Annals, Entomological Society of America. 9—

The Entomologist. 10—Proc. Ent. Soc. Washington. 12—Journal of Economic Ent. 14—Entomologische Zeit., Frankfurt a. M. 15—Insecutor Ins. Menstruus. 19—Bull., Brooklyn Ent. Soc. 24—Annales, Soc. Ent. de France. 25—Bull., Soc. Ent. France. 26—Ent. Anzeiger, Wien. 69—Comptes Rendus des Seances, Acad. Sci. Paris. 78—Bull. Biol. de la France et de la Belgique. 104—Zeit. f. Wissen. Zool., Leipzig. 107—Biologisches Zentralblatt. 108—Jour. Washington Acad. Sci. 118—Die Naturwissenschaften, Berlin. 130—Ohio Jour. of Sciences. 133—Jour. Experimental Zool. 138—Amer. Mus. Novitates, New York. 154—Zoolog. Anzeiger.

GENERAL.—British correlating committee for the protection of nature.—**4,** lvii, 234. **Heikertinger, F.**—Ueber die begriffe "mimikry" und "mimese" mit besonderer berucksichtigung der myrmekoidie.—**107,** xlv, 272-89. **Horn, W.**—Bericht den dritten internationalen kongress fur entomologie in Zurich 1925.—**118,** 1925, 836-8. **Morrill, A. W.**—Commercial entomology on the west coast of Mexico.—**12,** xviii, 707-16. **Pruvost, P.**—Fossil insects of the carboniferous period.—Nature, cxvi, 526-8. **Reichensperger, A.**—"Ameisenmimikry" und "metoke myrmekoidie."—**107,** xlv, 290-303. **Sherman, F.**—Progress on state insect survey with comparative data on other animal groups.—Jour. Mitch. Soc., xli, 129-34. **Snyder, T. E.**—Communism among insects.—Sci. Month., xxi, 466-77. **Vickery, R. A.**—List of parasitic insects reared from host insects collected in the vicinity of Brownville, Tex.—**10,** xxvii, 137-41. **Weiss, H. B.**—Insect food habit ratios in Death Valley and vicinity.—**130,** xxv, 253-4. **Zoological Record,** Insects of vol. 61, 1924, 317 pp.

ANATOMY, PHYSIOLOGY, MEDICAL, ETC.—Gatenby & Stopes.—Spermatogenesis of spiders.—Nature, cxvi, 499. **Hilton, W. A.**—Functional divisions of the nervous system of insects.—Science, lxii 372-73. **Peacock, A. D.**—Haploidy in the male sawfly and some considerations arising therefrom.—Nature, cxvi, 537-8. **Ross, R.**—Mosquito-theory of malaria and the late Prof. G. B. Grassi.—Sci. Progress, London, xx, 311-20. **Singh-Pruthi, H.**—Studies on insect metamorphosis. III. Influence of starvation.—Br. Jour. Exp. Biology, iii, 1-8. **Swingle, H. S.**—Digestive enzymes of an insect.—**130,** xxv, 209-18. **Yonge, C. M.**—The

digestion of cellulose by invertebrates.—Sci. Progress, London, xx, 242-8.

ARACHNIDA AND MYRIOPODA.—Emerton, J. H.—Spider collections of F. W. Waugh.—Can. Field-Nat., xxxix, 139-40. **Hulse, E. P. & Brown, B.**—Luminous spiders.—Science, lxii, 329.

(N) ***Ewing, H. E.**—Two new chiggers (Trombicula larvae).—**10,** xxvii, 145-6. ***Petrunkevitch, A.**—New Erigoninae from Tennessee.—**6,** xxxiii, 170-6. ***Petrunkevitch, A.**—Descriptions on new or inadequately known American spiders.—**7,** xviii, 313-23.

THE SMALLER ORDERS OF INSECTA.—Davis, W. T.—Pantala flavescens captured by Anax junius.—**6,** xxxiii, 189. **Dodds, G. S.**—Ecological studies on aquatic insects. Altitudinal range and zonation of mayflies, stoneflies and caddisflies in the Colorado Rockies.—Ecology, vi, 389-90. **Lacroix, L.**—Note detachee sur les oeufs des Chrysopides.—**25,** 1925, 227-32. **Smith, R. C.**—Neuroptera and Mecoptera of Kansas.—**19,** xx, 165-71. **Traver, J. R.**—Observations on the ecology of the mayfly Blasturus cupidus.—**4,** lvii, 211-18.

(N) ***Hood, J. D.**—Four new Phloeothripidae from the U. S. (Thysanoptera).—**4,** lvii, 218-22.

(S) ***Denis, J. R.**—Sur les Collemboles du Mus. de Paris.—**24,** xciv, 261-90.

ORTHOPTERA.—Cappe de Baillon, P.—Sur embryogenese des monstres doubles chez les Phasmides (Carausius morosus).—**69,** clxxxi, 479-81. **Davis, W. T.**—Female of the roach, Parcoblatta caudelli, and the occurrence of the species on Long Island, N. Y.—**6,** xxxiii, 188-9. **Fulton, B. B.**—Physiological variation in the snowy tree cricket, Oecanthus niveus.—**7,** xviii, 363-83. **Vogel, R.**—Bemerkungen zum weiblichen geschlechtsapparat der kuchenschabe (Periplaneta orientalis).—**154,** lxiv, 56-62.

HEMIPTERA.—Bergroth, E.—On the "Annectant bugs" of McAtee and Malloch.—**19,** xx, 159-64. **Clark, L. B.**—Note on tropisms in Plea striola.—**19,** xx, 186-7. **Griswold, G. H.**—Study of the oyster-shell scale, Lepidosaphes ulmi, and one of its parasites, Aphelinus mytilaspidis.—Cornell Univ. Mem. No. 93. **Knowlton, G. F.**—Digestive tract of Longistigma caryae (Aphididae).—**130,** xxv, 244-52. **Myers, J. G.**—Biological notes on Arachnocoris albomaculatus (Nabidae).—**6,** xxxiii, 136-46. **Poisson, R.**—Contribu-

tion a l'etude des hemipteres aquatiques.—**78,** lviii, 47-204. **Torre-Bueno, J. R.**—Food plant of Corythucha marmorata. Velia watsoni—a new record.—**19,** xx, 179, 185.

(N) ***Ball & Delong.**—Genus Dikraneura and its allies in No. Am.—**7,** xviii, 324-40. ***Ferris, G. F.**—Notes on Coccidae XI.—**4,** lvii, 228-34.

(S) ***Harris, H. M.**—Two n. sps. of Carthasis [from Cuba] (Nabidae).—**19,** xx, 172-4. ***Moreira, C.**—Pulgoes do Brasil.—Inst. Biol. Defesa Agr., Bol. No. 2.

LEPIDOPTERA.—Bird, H.—Some little known noctuid larvae of the genera Chabuata, Gortyna and Archanara.—**6,** xxxiii, 182-7. **Lemmer, F.**—Acronycta lanceolaria.—**6,** xxxiii, 181. **Minnich, D. E.**—Reactions of the larvae of Vanessa antiopa to sounds.—**133,** xlii, 443-69. **Roeher, A.**—Uber den zusammenhang von farbung, sinnen und lebensweise bei den schmetterlingen.—**26,** v, 138-9 (Cont.). **Watson, J. H.**—On the pouch-forming (sphragidal) fluid in Parnassius.—**9,** lviii, 246-8. **Weiss, H. B.**—Butterfly collecting by Sha Abbas the Great.—**6,** xxxiii, 187.

(N) ***Engelhardt, G. P.**—Studies of No. Amer. Aegeriidae.—**19,** xx, 153-8.

(S) ***Ferreira d'Almeida, R.**—Quelques rectifications sur les Actinote de la partie orientale de Amerique du Sud.—**24,** xciv, 333-54.

DIPTERA.—Brumpt, E.—Capture des larves de culicides par les plantes du genre Utricularia.—An. de Parasitol. Hum. et Comp., Paris, iii, 403-11. **Reith, F.**—Die entwicklung des Musca-eies nach ausschaltung verschiedener eibereiche.—**104,** cxxvi, 181-238. **Rudolfs, W.**—Relation between temperature, humidity and activity of house mosquitoes.—**6,** xxxiii, 163-9. **Vickery, R. A.**—(See under General.)

(N) **Malloch, J. R.**—Addition to the Sapromyzidae of the Dist. of Columbia.—**10,** xxvii, 152. ***Malloch, J. R.**—A new No. Am. sp. of Hydrotaea.—**19,** xx, 184-5. ***Spuler, A.**—No. Amer. sps. of the subgenus Scotophilella (Borboridae).—**6,** xxxiii, 147-62. ***West, L. S.**—New Phasiidae and Tachinidae from New York State.—**6,** xxxiii, 121-35.

(S) ***Alexander, C. P.**—Studies on the crane-flies of Mexico.—**7,** xviii, 341-62. ***Dyar, H. G.**—The mosquitoes of Panama.—**15,** xiii, 101-95.

COLEOPTERA.—Ainslie, C. N.—Notes on the habits and life history of Calligrapha pnirsa.—**4,** lvii, 209-11. **Brauer, A.**—Studies on the embryology of Bruchus quadrimaculatus.—*7*, xviii, 283-312. **Schjelderup-Ebbe, T.**—Biologie von Geotrupes.—**14,** xxxix, 97-8.

(N) ***Chittenden, F. H.**—New sp. of Trichalophus.—**10,** xxvii, 141. ***Fisher, W. S.**—Change of name in Buprestidae.—**10,** xxvii, 144. ***Fall, H. C.**—New sps. of Helmis.—**6,** xxxiii, 177-81. ***Fall, H. C.**—New sps. of Col. of recent discovery.—**19,** xx, 180-3.

(S) ***Pic, M.**—Melanges exotico-entomologiques, Fasc. 44, Nouveautes diverses, 32 pp.

HYMENOPTERA.—Arbuckle, H. B.—Life and habits of the honey bee.—Jour. Mitch. Soc., xli, 47-63. **Chamberlin, T. R.**—Some observations upon Necremnus leucarthros (Eulophidae).—**10,** xxvii, 142-4. **Descy, A.**—Recherches sur la sexualite et l'instinct chez les hymenopteres.—**78,** lvii, 1-37. **Frisch, K. v.**—Sinnesphysiologie und "sprache" der bienen.—Verh. Ges. Deut. Naturf. u. Arzte, Berlin, lxxxviii, 1924, 981-87. **Frost, S. W.**—Leaf-mining habit in the hymenoptera.—**7,** xviii, 399-416. **Griswold, G. H.**—(see under Hemiptera). **Howes [illegible] G.**—Master architects of the jungle.—Nature Mag., 1[illegible], 274-6. **Nolan, W. J.**—Blood-rearing cycle of the honey-bee.—U. S. Dep. Agr., Bull. No. 1349. **Parker & Thompson.**—Notes on the larvae of the Chalcidoidea.—**7,** xviii, 384-98. **Peacock, A. D.**—Studies in the parthenogenesis and sexuality of the saw-flies.—Br. Jour. Exp. Biology, iii, 61-84. **Robertson, C.**—Heterotropic bees.—Ecology, vi, 412-36. **Vickery, R. A.**—(see under General). **Weld, L. H.**—Another gall that secretes honeydew.—**19,** xx, 175-9.

(N) **Cushman, R. A.**—Some generic transfers and synonymy in Ichneumonidae. **108,** xv, 388-92. ***Fouts, R. M.**—New serphoid parasites from No. and So. America.—**10,** xxvii, 147-52. ***Swenk, M. H.**—Two new bees of the genus Colletes, oligotropic upon Petalostemum.—**138,** No. 186.

A Monograph of the Plecoptera or Stoneflies of America north of Mexico. By J. G. Needham and P. W. Claassen. The Thomas Say Foundation of the Entomological Society of America, Established 1915, Volume II. Lafayette, Indiana, 1925, 8vo, 397 pages, 50 of which are occupied by

line-engraved plates, and 29 text figures. To be obtained from the Treasurer of the Foundation, Prof. J. J. Davis, at Lafayette, Ind. Price $5.00.

The appearance of a monograph on a group of our native insects so little studied in North America as the stoneflies is a noteworthy event and will doubtless result in more attention being paid to this primitive order. It is needless to say that just such works as this monographic revision are greatly needed and that when produced they should be added to every zoological and entomological library. The introductory portion of the volume occupies 22 pages (Biology 1½, Collecting and Preserving ¾ and Diagnostic Characters 19—15 of these on Venation and variations therein in a few species and 3 on Genital Characters). Classification and taxonomic descriptions extend from page 30 to page 278, in which keys are given to the families, genera and species. On pp. 286-289 is a "List of the Species herein treated," 207 in number and indicating their grouping under a series of subgenera not mentioned in the body of the work, hence liable to be overlooked, and not characterized nor with type species designated. One genus, *Clioperla*, and 28 species are described as new. There is a bibliography (pp. 279-284), a comparative table of classifications of Plecoptera from that of Pictet, 1842, to the present volume (p. 285), and a table showing the number of species of each of the 24 genera recorded for each of the United States and of the Provinces of Canada. The figures in the text show chiefly whole insects; those on the plates depict the wings and genitalia and, in a goodly number of species, the eggs, head, prothorax, mouth parts, feet, antennae or tails, and are pronounced "good" by a specialist. Alphabetical Index, pp. 392-7.

A regrettable error has been made in the lettering on the back of the book, from which it would appear that this is the second volume of a work on the Plecoptera of North America, whereas the real meaning is, as stated on the first title page, that this is Vol. II of the Thomas Say Foundation.

PHILIP P. CALVERT

A BIBLIOGRAPHY OF THE NORTH AMERICAN HEMIPTERA-HETEROPTERA. By HOWARD MADISON PARSHLEY, Sc.D., Associate Professor of Zoology in Smith College. Smith College Fiftieth Anniversary Publication. Northampton, Mass., 1925. 8vo, pp. ix, 252.—In 1917 the University of California published Mr. E. P. Van Duzee's *Catalogue of the Hemiptera of America north of Mexico*. Now Smith College honors itself

and a brilliant member of its faculty in this bibliography intended primarily to supplement Van Duzee's 'Catalogue,' and undertaken at the instance of the author of that work." About 2250 titles by 600 authors are included. How complete this bibliography is must be left to specialists to determine, although its author himself modestly suggests that "the opportunities for error and omission are multitudinous." We hope that he has overestimated these and are sure that this work *will* be of service to those classes of students and librarians whom he has in mind in page viii of his preface.

Beyond the contents of this beautifully printed and carefully prepared volume lies a further Utopia not yet existent—in print—we believe. That is a subject index to the contents of the publications here listed. Not a taxonomic index, for that is provided by Van Duzee's *Catalogue,* but an anatomical, physiological, ecological and general biological index is what we have in mind. On this topic we may have more to say in a future number of the NEWS, but this Bibliography would, of course, provide an excellent foundation for such a Utopia.

PHILIP P. CALVERT.

Doings of Societies.

The American Entomological Society.

Meeting of May 28, 1925. Dr. Henry Skinner, President, in the chair; eleven members, three visitors present.

Mr. Cresson, for the Committee on Excursions, reported that the trip to Dr. Skinner's home on May 16, had been successful, with excellent weather, twelve members being present. He showed photographs taken.

Messrs. John C. Lutz, Francis M. James, Jr., Emil Fred Schaff and John C. West were elected resident members.

DIPTERA. Mr. E. T. Cresson, Jr., showed his mounted specimens taken on the Media trip. Among these was a female of *Glutops singularis,* of which only one other specimen is known in collections.*

COLEOPTERA. Mr. Hornig told of trips to Tacony Park, Philadelphia, made in answer to an inquiry in regard to Japanese beetle larvae. He found the larvae very abundant, having destroyed grass over considerable areas by eating the roots. Mr. Hornig also noted that birds (starlings, purple grackles, flickers, sparrows, robins) were digging out the larvae and eating them.

* See Ent. News, xxxvi, p. 211, July, 1925.

ECONOMIC. Dr. Calvert showed a piece of rope which had been sent to him with an inquiry as to injury which was supposed to have been caused by insects and asked members for suggestions. No one present could say anything definite.

LEPIDOPTERA. Mr. Williams made some remarks on the aedeagus of the Hesperidae.

ROBERT TITHERINGTON, *Secretary.*

Meeting of September 24, 1925. Dr. Skinner presiding; fifteen members and visitors present.

A joint letter from the British Correlating Committee for the Protection of Nature and the Entomological Society of London, regarding protection of butterflies was read. The following resolution was proposed and approved: Whereas there is great danger of exterminating some of the most beautiful species of insects for the use in works of art and jewelry, be it resolved that the American Entomological Society strongly disapproves of such practice and herewith places itself on record as opposing the use of insects for decorative purposes. It was moved and approved that a copy of this resolution be sent to the Correlating Committee.

Mr. Carl Ilg was elected a resident member.

COLEOPTERA.—Dr. Calvert exhibited a luminous larva (?) found near Corning in the Perkiomen valley, Pennsylvania, agreeing with a specimen in the Horn collection thought to be a female of *Phengodes laticollis* Lec. The specimen was collected by Dr. R. E. Cleland and was given to the speaker who had kept it alive in a glass for two months. Dr. Calvert also spoke of specimens of *Dynastes tityus* in Pennsylvania and of the S. S. Rathvon collection of Coleoptera preserved in the science building of Franklin and Marshall College, Lancaster, Pennsylvania.

In the discussion that followed Mr. Brownback reported that he had found five specimens of *Phengodes*, females, at Falls of French Creek, Pennsylvania, during the latter part of July. Unfortunately these specimens were lost.

ORTHOPTERA.—Mr. Brownback also mentioned an observation on *Melanoplus femur-rubrum*. He estimated that there were about 10,000 specimens resting on the sunny side of twelve panels of a three rail fence during the first part of September at Trappe, Pennsylvania.

R. TITHERINGTON, *Secy.*

OBITUARY.

Carlo Emery.

On the eleventh of last May the world lost one of its most distinguished entomologists, Professor Carlo Emery, from acute uricaemia. He was born at Naples, October 25, 1848, of Swiss parents, who had acquired Italian citizenship. After pursuing courses in general medicine he decided, about 1872, to specialize in ophthalmology, but biological studies soon attracted him more powerfully and he became professor of zoölogy in the University of Cagliari, in Sardinia. This post he held from 1878 to 1881, but on the death of his father he moved to Bologna, where he occupied the chair of zoölogy in the ancient university till his retirement several years ago. He married an Italian lady and leaves two very promising children, Lucia and Luigi.

Professor Emery was unusually talented. He spoke and wrote admirably Italian, French, German, English and Spanish, besides possessing a reading knowledge of several other languages, including Russian. His great skill as a draftsman enabled him to enrich his monographs with many figures so accurate as to permit ready identification of the most closely related species; and his linguistic knowledge enabled him to pen descriptions so concise that there is very rarely any question as to the identity of the forms he was observing. Although he published a valuable textbook of general zoölogy (second edition, 1904), a well-known monograph on the singular fishes of the genus Fierasfer (1880) and papers on the anatomy of vipers (1873) and the luminescence of fire-flies (1884), the 300 papers which he contributed to Entomology during the past 56 years (1869-1925) are almost entirely devoted to the Formicidæ. And although he was chiefly occupied with the taxonomy, morphology and geographical distribution of ants, he published several interesting papers on their habits and instincts. There is scarcely a country to a knowledge of whose antfauna he did not make important contributions. His work

throughout is of the highest quality, because he was not interested primarily in securing priority in the description of species—though he described many hundreds of them—but in monographic revision of groups of species or whole faunas and a precise definition of the known forms, their relationships and distribution. He was exceedingly conservative in creating genera and species and made great use of subgenera, subspecies and varieties as provisional categories. His long and intricate taxonomic studies culminated in the magnificent volumes on the Formicidæ in Wytsman's "Genera Insectorum," which contain a list of all the known species, subspecies and varieties of ants and their genera, with many new and profound considerations on their natural grouping in tribes and subfamilies. No entomologist of the past or present generation has done such a large amount of very accurate taxonomic work and work so worthy of being taken as a model by younger men, especially in the United States, and no active entomologist has created fewer synonyms or introduced less confusion into the science.

Although I owe a great deal to Professor Emery, with whom I have corresponded since 1899, and who has helped me on innumerable occasions with his very expert opinion, as he has helped every living myrmecologist, I unfortunately had no opportunity to meet him and have had to draw many of the facts in regard to his life from a brief necrologue by Professor Forel (Bull. Ann. Soc. Ent. Belg. 65, 1925, p. 198-199). Both of these eminent entomologists were born in the same year and both, building on the secure foundations laid by Gustav Mayr, coöperated in enormously extending and deepening our knowledge of the ant faunas of all parts of the world and in encouraging younger men to take up the study of these fascinating insects. In the following paragraph Professor Forel gives some more intimately personal details in regard to a singular parallelism between his life and that of Professor Emery:

"I made his acquaintance about 1871 at the Chateau de

Prilly, near Lausanne, which his father still owned, though it has since been sold. There we learned that as children we had both observed the ants, he at Prilly and I at Lonay or at Vaux sur Morges, that is separated only by a distance of less than eight kilometers, without suspecting each other's existence or our mutual myrmecological predilections. But the parallelism of our lives did not end there. C. Emery had scarcely been made professor at Cagliari when in 1879 I was elected professor at Zürich. Both of us employed our days and weeks of vacation in studying our little friends, the ants, he in Italy mainly, I sometimes on long voyages. In 1906, while sojourning in Switzerland, at Bois-Bougy sur Rolle, he was suddenly prostrated by a very severe apoplectic stroke. I was called and thought he was lost and my son aided his wife in caring for him under the supervision of a physician at Rolle. But although he was aphasic and remained paralyzed on the right side, he not only learned to write with his left hand, but succeeded a year later in performing experiments on ants, describing and even drawing them (with his left hand) with indomitable perseverance and all his former sagacity. And then I myself, in 1912, was prostrated by an attack which paralyzed my right arm and vocal organs. After that I imitated Emery in all respects, except in my incapacity to draw with my left hand. Since that time our correspondence has been left-handed. In Italy, C. Emery attracted many students who will continue his work. As I learn today, he had ordered before his death that there should be no funeral, no religious intervention, no discourse, no music, no flowers, except those given by his family. It is odd that, without knowing of this, I had long ago made the same arrangements in regard to myself."

WILLIAM MORTON WHEELER.

HENRY W. WENZEL, well-known collector of Coleoptera and active spirit in the Feldman Collecting Social (1887-1925), died in Philadelphia, November 7, 1925. We hope to present a longer notice in a later number of the NEWS.

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The date of mailing the December, 1925, number will be announced on the last page of the issue for January, 1926.

INDEX TO VOLUME XXXVI.

(*indicates new genera, species or varieties)

ALEXANDER, C. P. Undescribed species of crane-flies from the eastern United States and Canada..... 200
ANDREWS, E. A. McCook's ant mounds in Pennsylvania, revisited 173
BALDUF, W. V. The feeding of a common tiger beetle.. 275
BARE, C. O. A new species of *Buenoa* (ill.)..... 225
BARNES & BENJAMIN. A new subspecies of *Brenthis myrina*..... 44
Notes on two butterfly names omitted from recent lists. 118
On *Dysodia granulata* 273
BAUMANN, K. Information wanted on *Papilio troilus*.... 185
BEAMER, R. H. The overwintering of *Vespula communis* var. *flavida* 309
(See also Hungerford & Beamer.)
BENJAMIN, F. H. (See Barnes & Benjamin.)
BEQUAERT, J. *Neotermes* injurious to living guava tree, with notes on other Amazonian termites (ill.)..... 289
BISHOP, S. C. (See Crosby & Bishop.)
BLAISDELL, F. E. Coleoptera of the Pacific coast, notes and criticisms 79
BLATCHLEY, W. S. Some additional new species of Heteroptera from the southern United States, with characterization of a new genus 45
Two changes of names 245
BRIMLEY, C. S. New species of Diptera from North Carolina 73
Odonata notes from North Carolina 85
CALVERT, P. P. Editorial: Entomology at the convocation week meetings, December, 1924 55
Editorial: Evolutionary entomology 244
Editorial: Give us entomological news 147
Editorial: Hope 122
Editorial: How to meet the rising costs of publication. 27
Editorial: An international congress of entomology in 1925 27

Editorial: "Our financial column" 184
Editorial: A reminder for collectors of insects..... 208
Obituary: Eugene Simon 222
Obituary: Paul Revere Myers 192
Review: Bibliography of the North American Hemiptera Heteroptera 315
Review: Fiji-New Zealand expedition 158
Review: An introduction to entomology 94
Review: Monograph of the Plecoptera of America north of Mexico 314
Review: Report of the proceedings of the fifth entomological meeting held at Pusa 63
Review: Revista Chilena de historia natural 157
CHAMBERLIN, R. V. A new lithobiomorphous chilopod from Uruguay 120
CHAMPLAIN, KIRK & KNULL. Notes on Cerambycidae 105, 139
CHAMPLAIN & KNULL. A new species of *Lepturges* 207
COCKERELL, T. D. A. *Diploplectron* in California 87
Review: Handbook of the tsetse flies 62
COOLIDGE, K. R. Burroughs and bugs 24
The life history of *Euchloe creusa hyantis* 65
Nathalis iole in California 86
Strymon loki—a correction 26
CORT, W. W. The American society of parasitologists.. 149
CRAMPTON, G. C. Review: General textbook of entomology 283
CRESSON, E. T., JR. Another record for the female of *Glutops singularis* 211
Descriptions of new genera and species of the dipterous family Ephydridae 165
Editorial: What shall be done with the NEWS? 86
Entomological literature. (See under General Subjects.)
Minutes of Entomological Section 128
CROSBY & BISHOP. Two new spiders from the Blue Ridge mountains of North Carolina (ill.) 142
CURRAN, C. H. Three new nearctic Tachinidae 13

DODGE, E. A. Notes on the life history of *Catocala whitneyi* 267
EWING, H. E. New mites of the family Dermanyssidae. 18
FELT, E. P. New York State collection of insects..... 211
FOX, C. A new genus of the Siphonaptera 121
FRISON, T. H. Review: Anatomy and physiology of the honey bee 219
FROST, S. W. Convergent development in leaf mining insects 299
GARNETT, R. T. de. L'Abeille 185
GILMER, P. M. Note on the poison apparatus of *Lagoa crispata* 231
GOE, M. T. Eight months study of earwigs 234
GUNDER, J. D. Avoiding name priority confusion 276
California's annual butterfly show 123
Calpodes ethlius in California 273
Lower California open to entomologists 211
Several new aberrant Lepidoptera (ill.) 193
Several new varieties of and aberrant Lepidoptera from California (ill.) 1
HARRIS, H. M. A new species of Nabidae from the western United States 205
HASEY, W. H. A new species of *Trogus* 306
HATCH, M. H. A catalogue of the Coleoptera of Michigan 244
HAYES, W. P. A preliminary list of the ants of Kansas 10, 39, 69
HERRICK, G. W. Notes on some little known thrips (ill.) 180
HOOD, J. D. Six new Thysanoptera from the western United States 101, 134
HOUGH, W. S. The anal lobe of *Pseudococcus comstocki* (ill.) 52
HOWARD, L. O. An appeal for Hungarian entomologists. 54
The international entomological congress at Zurich ... 286
Parasitic Hymenoptera feeding by indirect suction.... 129
Wanted—Live cocoons of giant silk worms 274
HUBBELL, T. H. *Melanoplus stonei* in Michigan 168
HUFF, C. G. The "sun-ray" structure in the posterior larval spiracles of some muscoid flies (ill.) 239
HULL, F. M. Dipterological work in South Dakota 209

HUNGERFORD & BEAMER. Report of collections of aquatic Hemiptera taken in Cherokee County, Kansas, and other new records from the state.....262, 295
JOHANNSEN, O. A. A new sciarid from the eastern United States 266
JONES, F. M. *Hyaloscotes fumosa* (ill.) 161
North American Psychids: *edwardsii* Heyl (ill.)..... 33
KIRK, H. B. (See Champlain, Kirk & Knull.)
KLAGES, E. A. What becomes of great collections? 146
KNIGHT, H. H. Description of a new species of *Plagiognathus* from the eastern U. S. 305
Neocapsus cuneatus in Arizona and Texas, with a variety described from Mississippi and North Carolina.. 78
KNULL, J. N. (See Champlain, Kirk & Knull.)
LENG, C. W. Obituary: Thomas Lincoln Casey 97
MCATEE, W. L. European species of *Euptery.x* in the United States 88
Predatorial capacity 77
NEEDHAM, J. G. Entomologists are honest 149
Some aquatic neuropteroid insects of Lake George.... 110
SATTERTHWAIT, A. F. Two new species of *Calendra*.... 269
SCHAUS, W. Two new Saturnids from South America.. 25
SKINNER, H. Editorial: Coleman T. Robinson 309
Third international congress of entomology 57
TITHERINGTON, R. J. Minutes of The American Entomological Society 254, 316
TOWNSEND, C. H. T. Work on the United States National Museum collection of Muscoid Diptera from 1914 to 1919 22
VIERECK, H. L. Recent impressions of the British Museum 308
WEISS, H. B. Coleoptera new to New Jersey 310
Jean Henri Fabre and Eleanor Ormerod 95
Washington Hoppin, M.D., illustrator of Jaeger's "Life of North American Insects" (ill.) 257
WEISS & WEST. An adelid gall on Virginia creeper 116
WEST, E. (See Weiss & West.)
WHEELER, W. M. Obituary: Carlo Emery 318
WILLIAMS, R. C. Minutes of The American Entomological Society 159

GENERAL SUBJECTS.

L'Abeille 185
American entomological society, Minutes 159, 254, 316
Animals attacked by insects .. 18
Aquatic insects 110
British Museum, Recent impressions of 308
Burroughs and bugs 24
Butterfly show 123
Changes of addresses 245
Collections, New York State 211
Collections?, What becomes of 146
Collectors, A reminder for .. 208
Convocation week meetings .. 55
Costs of publication 27
Development in leaf mining insects, Convergent 299
Entomological literature 28, 58, 88, 123, 150, 186, 212, 245, 277, 310.
Entomological section of the Academy of Natural Sciences of Philadelphia, Minutes 126
Eulan, Note on 208
Evolutionary entomology 244
Expedition to Pacific tropical America 209
Feeding by indirect suction .. 129
Honest, Entomologists are .. 149
Hope (Editorial) 122
Hungarian entomologists, Appeal for 54
Imperial entomological conference 109
Insects attacked by insects 77, 234, 275
International congress of entomology 27, 57, 148, 286
Jaeger's Life of North American Insects, Illustrator of (ill.) 257
Kansas entomologists organize a state society 221
Leaf mining insects, Development in 299
List of insects, New York state 57, 148
Lorquin entomological club .. 123
Lower California open to entomologists 211
Mailing practice, Better 186
News, Give us 147
Our financial column 184
Parasitic insects 18
Parasitologists, American society of 149
Plants attacked by insects 65, 87, 105, 180, 289
Protection of insects 272
Radio, Entomology by 274
What shall be done with the News? 86
Zoological record, Insecta part 208, 274

OBITUARY NOTICES.

Bang-Haas, A. 128
Butler, A. G. 256
Cant, A. 222
Casey, T. L. 97
Emery, C. 318
Fassl-Teplitz, A. H. 96
Grassi, G. B. 224
Griffiths, G. C. 222
Ilcheff, D. 224
Melichar, L. 224
Myers, P. R. 192
Simon, E. 222
Wenzel, H. W. 320
Wytsman, P. 224

PERSONALS.

Adams, C. F. 275
Burroughs, J. 24
Cockerell, T. D. A. 148
Fabre, J. H. 95
Ferris, G. F. 209
Gibson, A. 109
Hoppin, W. 257

Mann, W. M. 245
Ormerod, E. 95
Robinson, C. T. 309
Schaus, W. 138
Smith, A. P. 275
Van Duzee, E. P. 276

REVIEWS.

Austen: Handbook of the tsetse flies 62
Comstock: Introduction to entomology 94
Nutting: Fiji-New Zealand expedition 158
Imms: General textbook of entomology 283
Needham & Claassen: Monograph of Plecoptera 314
Parshley: Bibliography of Hemiptera-Heteroptera 315
Report of fifth Pusa meeting 63
Revista Chilena historia natural 157
Snodgrass: Anatomy and physiology of the honey bee 219

GEOGRAPHICAL DISTRIBUTION.

Arizona: Hem., 78. Lep., 193, 273. Thys., 101.
California: Col., 79. Dip., 165. Hem., 52, 205. Hym., 87. Lep., 1, 65, 86, 123, 161, 193, 276. Siph., 121.
Colorado: Lep. 44, 193. Thys., 101, 134.
Florida: Dip., 225. Hem., 45.
Illinois: Dip., 275.
Indiana: Arach., 18.
Kansas: Col., 269. Hem., 225, 262. Hym., 10.
Louisiana: Col., 207. Dip., 165.
Massachusetts: Hem., 88. Lep., 193.
Michigan: Dip., 200, 229. Orth., 168.
Minnesota: Col., 269.
Missouri: Odon., 77.
New Jersey: Col., 160, 310. Dip., 165. Lep., 116, 185.
New York: Dip., 200, 266. Hem., 306. Hym., 306. Neu., 110. Thys., 180.
North Carolina: Dip., 73, 200, 229. Hem., 45. Odon., 85. Arach., 142.
Oregon: Hem., 205.
Pennsylvania: Col., 105, 159, 317. Dip., 211. Hym., 173. Lep., 128. Orth., 317.
Texas: Lep., 33. Hem., 78, 225. Thys., 134.
Virginia: Arach., 18
Canada: Dip., 165, 200. Lep., 193.
West Indies: Dip., 165.
Central America: Dip., 165.
South America: Lep., 25. Neu., 289. Arach., 18, 120.

ARACHNIDA.

Araneina 142
brevipes, Leiognathus* 19
chilensis, Liponyssus* 21
Dermanyssus (see *oti*).
easti, Serpenticola* 18
Leiognathus (see *brevipes, chilensis*).
Leptoneta (see *silvicultrix*).
Liponyssus (see *robustipes*).
*Microhexura** 145
montivagus, Microhexura* (ill.) 145
oti, Dermanyssus* 21
robustipes, Liponyssus* 20
Serpenticola (see *easti*).
silvicultrix, Leptoneta* (ill.) 142

COLEOPTERA.

aceris, Xylotrechus 139
aculifer, Leptostylus 140

acuminata, Ophistomis 108
Aegomorphus (see *decipiens*).
aeneola, Halicta* 245
aenescens, Halicta 245
Amphicoma (see *vulpina*).
Aneflomorpha (see *subpubescens*).
Anthophilax (see *attenuatus, malachiticus*).
Arhopalus (see *fulminans*).
Astylidus (see *parvus*).
attenuatus, Anthophilax 107
axillaris, Purpuricenus 139
bajalus, Hylotrupes 108
Batyle (see *suturalis*).
Bembidion (see *suspectum*).
blaisdelli, Omus 80
Brachypterus cinereus in New Jersey 310
Calendra (see *multilineatus, medoraensis*).
Catalogue of coleoptera of Michigan 244
Change of name in *Halicta* .. 245
Cicindela (see *latisignata, pacifica*).
Clytoleptus (see *tristis*).
Clytus (see *marginicollis*).
colonus, Xylotrechus 139
cortiphagus, Romaleum 105
crassicornis, Eulabis 83
cyanipennis, Gaurotes 107
Cyrtophorus (see *verrucosus*).
decipiens, Aegomorphus 140
depsarium, Tragosoma 105
Derancistrus (see *taslei*).
Eburia (see *quadrigeminata*).
Elaphidion (see *mucronatum*).
Eleodes (see *snowi*).
emarginata, Leptura 107
Eulabis (see *crassicornis, montanus*).
Eupogonius (see *pubescens, subarmatus*).
facetus, Lepturges 141
famelica, Ophistomis 108
Feeding of tiger beetle 275
fulminans, Arhopalus 108
Gaurotes (see *cyampennis*).
Heterachtes (see *quadrimaculatus*).
Hylotrupes (see *bajalus*).
lateralis, Saperda 141
latisignata, Cicindela 80
Leiopus (see *variegatus*).
Leptostylus (see *aculifer*).
Leptura (see *emarginata*).
Lepturges (see *symmetricus, regularis, signatus, querci, facetus, minutus*).
lignea, Semanotus 108
Listrus (see *montanus*).
luteicornis, Ophistomis 108
malachiticus, Anthophilax .. 107
marginicollis, Clytus 139
medoraensis, Calendra* 270
minutus, Lepturges* 207
montanus, Eulabis 83
montanus, Listrus 83
mucronatum, Elaphidion 106
multilineatus, Calendra* 269
myops, Oberea 142
Oberea (see *myops, ruficollis*).
Obrium (see *rufulum*).
Omus (see *reynoldsi, blaisdelli*).
Ophistomis (see *famelica, acuminata, luteicornis*).
pacifica, Cicindela 81
parvus, Astylidus 140
Phengodes laticollis, Larva of 317
Philonthus varians in New Jersey 310
Plagiodera (see *versicolor*).
Psapharochrus (see *quadrigibbus*).
Psenocerus (see *supernotatus*).
Pseudibidion (see *unicolor*).
pubescens, Eupogonius 141
Purpuricenus (see *axillaris*).
quadrigeminata, Eburia 105

quadrigibbus, Psapharochrus 140
quadrimaculatus, Heterachtes 106
quadrimaculatus, Xylotrechus 108
querci, Lepturges 141
regularis, Lepturges 140
reynoldsi, Omus 79
Romaleum (see *cortiphagus*).
ruficollis, Oberea 142
rufulum, Obrium 106
Saperda (see *lateralis*).
Scarabaeus (see *tityus*).
schaumi, Stenocorus 106
Semanotus (see *lignea*).
signatus, Lepturges 140
snowi, Eleodes 84
Stenocorus (see *schaumi, trivittatus*).
Strangalia (see *subhamata*).
subarmatus, Eupogonius 141
subhamata, Strangalia 107
subpubescens, Aneflomorpha . 106
supernotatus, Psenocerus 140
suspectum, Bembidion 82
suturalis, Batyle 140
symmetricus, Lepturges 140
taslei, Derancistrus 105
Tiger beetle, Feeding of 275
tityus, Scarabaeus 127
Tragosoma (see *depsarium*).
tristis, Clytoleptus 139
trivittatus, Stenocorus 106
unicolor, Pseudibidion 106
variegatus, Leiopus 140
verrucosus, Cyrtophorus 139
versicolor, Plagiodera 159
vulpina, Amphicoma 160
Xylotrechus (see *quadrimaculatus, aceris, colonus*).

DIPTERA.

adfinis, Trimerina 165
adjuncta, Ceropsilopa* 165
annamariae, Odontomyia* 76
anthracina, Limnaemyia 13
Antocha (see *obtusa*).
Calliphora (see *erythrocephala*).
carolinensis, Ormosia* 229
Cerometopum (see *lacunosum*).
Ceropsilopa (see *adjuncta, staffordi*).
Chilosia (see *swannanoa*).
compactus, Limnaemyia* 14
Crane-flies (see Tipulidae).
Dasymolophilus (see *Molophilus*).
Dicranota 202
(see also *divaricata*.)
Dipterological work in South Dakota 209
disjuncta, Microphthalma 18
Ditrichophora (see *nadinae*).
divaricata, Dicranota* 203
dorothea, Odontomerus* 74
Drosophila (see *hydei*).
Ephydra (see *pacifica*).
erythrocephala, Calliphora .. 239
Eulonchus (see *marialiciae*).
floridensis, Molophilus* 230
Glenanthe (see *litorea*).
Glutops (see *singularis*).
haemorrhoidalis, Limnaemyia. 14
hydei, Drosophila 240
lacunosum, Cerometopum* .. 165
Larval spiracles of muscoid flies (ill.) 239
litorea, Glenanthe* 166
Limnaemyia 13
(see also *anthracina, varia, compactus, haemorrhoidalis, nigrescens.*)
marialicae, Eulonchus* 77
michiganensis, Microphthalma 17
Microphthalma 15
(see also *phyllophagae, disjuncta, michiganensis.*)
Molophilus (see *niphadias, floridensis*).
Muscoid Diptera, Work on collection of 22

Muscoidea, Larval spiracles of some (ill.) 239
*nadinae**, *Ditrichophora* 166
*nanciae**, *Tetanocera vicina* .. 75
Neuroctena (see *ruthae*).
*nigrescens**, *Linnaemyia* 14
*niphadias**, *Molophilus* 229
*obtusa**, *Antocha* 201
Odontomerus (see *dorothea*).
Odontomyia (see *annamariae*).
Ormosia (see *carolinensis*).
*pacifica**, *Ephydra* 167
Phormia (see *regina*).
*phyllophagae**, *Microphthalmo* 16
regina, *Phormia* 240
Rhaphidolabis 202
(see also *rogersiana*).
*rogersiana**, *Rhaphidolabis* .. 204
*ruthae**, *Neuroctena* 75
Sciara (see *similans*).
*similans**, *Sciara* 266
singularis, *Glutops* 211
*staffordi**, *Ceropsilopa* 166
Sun-ray structures in larva (ill.) 239
*swannanoa**, *Chilosia* 73
Tetanocera (see *nanciae*).
*Trimerinoides** 165
United States National Museum collection 22
*varia**, *Linnaemyia* 14

HEMIPTERA.

albida, *Buenoa* 228
Anal lobe of *Pseudococcus comstocki* (ill.) 52
Aquatic hemiptera, Report of a collection 262, 295
artemisiae, *Eupteryx* 88
australis, *Hydrometra* 295
Belostoma in Kansas 298
*brunneae**, *Glossoaspis* 51
Buenoa (see *scimitra*, *margaritacea*, *carinata*, *albida*, *limnocastoris*, *macrotibialis*, *elegans*).
table of species 228
carinata, *Buenoa* 228
Change of name in *Ischnodemus* 245
comstocki, *Pseudococcus* (ill.) 52
concinna, *Eupteryx* 88
cuneatus, *Neocapsus* 78
elegans, *Buenoa* 228
Eupteryx (see *artemisiae*, *concinna*, *melissae*, *stellulata*).
*floridana**, *Physopleurella* 47
flumineum, *Belostoma* 299
Gelastocoridae, Key to genera 50
Gelastocoris 50
*Glossoaspis** 50
(see also *brunnea*.)
hinei, *Microvelia* 296
Hydrometra (see *martini*, *australis*, *wileyi*).
*ilicis**, *Plagiognathus* 305
irrorata, *Notonecta* 297
Ischnodemus (see *pusillus*).
*leviscutatus**, *Neocapsus cuneatus* 79
limnocastoris, *Buenoa* 228
*longicornis**, *Malacopus* 46
*lovetti**, *Nabis* 205
lutearum, *Belostoma* 299
macrotibialis, *Buenoa* 228
Malacopus 46
(see also *longicornis*.)
margaritacea, *Buenoa* (ill.).. 228
martini, *Hydrometra* 295
melissae, *Eupteryx* 88
Microvelia (see *parallela*, *hinei*).
*minutus**, *Ischnodemus* 245
Mononyx 50
Nabis (see *lovetti*).
Neocapsus (see *cuneatus*, *leviscutatus*).
Notonecta (see *irrorata*).
*parallela**, *Microvelia* 48
Physopleurella 47
(see also *floridana*.)
Plagiognathus (see *ilicis*).

Pseudococcus comstocki, Anal lobe of (ill.) 52
*pusillus**, *Ischnodemus* .. 45, 245
Ranatra in Kansas 298
*scimitra**, *Buenoa* (ill.) 226
stellulata, Eupteryx 88
Van Duzee collection of Hemiptera 276
wileyi, Hydrometra 295

HYMENOPTERA.

Acamatus (see *Eciton*).
aggerans, Formica rufa 70
americana, Myrmicina graminicola 39
americanus, Camponotus castaneus 71
americanus, Lasius niger 70
analis, Iridomyrmex pruinosus 69
Ant mounds, McCook's 173
Ants of Kansas, List of 10, 39, 69
Aphaenogaster (see *mariae, treatae, fulva, tennesseensis*).
breviceps, Polyergus 71
Camponotus (see *nitidiventris, maculatus, castaneus, americanus, herculeanus, pennsylvanicus, ferugineus, nearcticus, minutus, decipiens, discolor, caryae*).
castaneus, Camponotus 71
caryae, Camponotus 72
claviger, Lasius 70
clara, Cremastogaster lineolata 42
commutatus, Eciton 12
commutata, Neoponera 294
Cremastogaster (see *lineolata, leviuscula, clara, missouriensis*).
croceum, Proceratium 11
curvispinosus, Leptothorax .. 43
decipiens, Camponotus fallax. 72
Diploplectron in California .. 87
discolor, Camponotus fallax .. 72
Dorymyrmex (see *pyramicus, flavus*).
Eciton (see *schmitti, opacithorax, commutatus, nigrescens*).
exsectoides, Formica 70
Feeding by indirect suction.. 129
ferrugineus, Camponotus herculeanus 72
flavida, Vespula communis .. 309
flavus, Dorymyrmex pyramicus 69
Formica (see *subintegra, aggerans, exsectoides, pallidefulva, schaufussi, nitidiventris, subsericea, subpolita*).
fulva, Aphaenogaster 43
hayesi, Pheidole 42
herculeanus, Camponotus 72
imparis, Prenolepis 69
interjectus, Lasius 70
Iridomyrmex (see *analis*).
Lasius (see *neoniger, americanus, umbratus, interjectus, claviger, latipes*).
latipes, Lasius 70
Leptothorax (see *schaumi, curvispinosus*).
leviuscula, Cremastogaster lineolata 42
lineolata, Cremastogaster ... 42
lucidus, Polyergus 71
maculatus, Camponatus 71
mariae, Aphaenogaster 42
melanderi, Prenolepis vividula 69
minimum, Monomorium 40
minimum, Monomorium minutum 40
minutus, Camopnotus fallax . 72
missouriensis, Cremastogaster victima 42
molesta, Solenopsis 40
Monomorium (see *pharaonis, minimum*).
Myrmica (see *rubra, sulcinodoides*).
Myrmicina (see *americana*).

nearcticus, Camponotus fallax 72
neoniger, Lasius niger 70
Neoponera (see *commutata*).
nietus, Prenolepis 69
nigrescens, Eciton 12
nigrocinctus, Trogus* 306
nitidiventris, Camponotus maculatus 71
nitidiventris, Formica pallidefulva 71
occidentalis, Pogonomyrmex. 43
opacior, Ponera trigona 12
opacithorax, Eciton 12
Overwintering of *Vespula*... 309
pallidefulva, Formica 70
pallipes, Stigmatomma 11
Parasitic hymenoptera feeding 129
parvula, Prenolepis 69
pennsylvanica, Ponera coarctata 11
pennsylvanicus, Camponotus herculeanus 72
pharaonis, Monomorium 40
Pheidole (see *pilifera, sitarches, vinelandica, hayesi*).
pilifera, Pheidole 41
Pogonomyrmex (see *rugosus, occidentalis*).
Polyergus (see *breviceps, lucidus*).
Ponera (see *pennsylvanica, opacior*).
Prenolepis (see *imparis, parvula, melanderi, nietus*).
Proceratium (see *croceum*).
pyramicus, Dorymyrmex 69
rubra, Myrmica 43
rugosus, Pogonomyrmex barbatus 43
schaufussi, Formica pallidefulva 70
schaumi, Leptothorax 43
schmitti, Eciton 12
Solenopsis (see *molesta, texana*).
sitarches, Pheidole 41
Stigmatomma (see *pallipes*).
subintegra, Formica sanguinea 70
subpolita, Formica 71
subsericea, Formica fusca ... 71
sulcinodoides, Myrmica rubra. 43
tennesseensis, Aphaenogaster. 43
texana, Solenopsis 40
treatae, Aphaenogaster 42
Trogus (see *nigrocinctus*).
umbratus, Lasius 70
Vespula (see *flavida*).
vinelandica, Pheidole 42

LEPIDOPTERA.

Aberrant Lepidoptera, New (ill.) 1, 193
Adela (see *ridingsella*).
Adelid galls 116
aereofuscus, Rhabdoides cellus* (ill.) 196
Anthocharis (see *sternitzkyi*).
Argynnis (see *comstocki*).
Atrytonopsis (see *polingi*).
baldyensis, Philotes battoides* (ill.) 3
Basilarchia (see *comstocki*).
biselliella, Tinea 209
Brenthis (see *tollandensis*).
Brephidium (see *coolidgei*).
carbonaria, Psyche 33
Calpodes (see *ethlius*).
calydon, Melitaea 119
Catocala whitneyi, Life history 267
Clothes moth, Process for preventing ravages of 208
cocklei, Papilio eurymedon albanus* (ill.) 200
coloradensis, Heodes heteronia (ill.) 194
comstocki, Argynnis calippe* (ill.) 8
comstocki, Basilarchia* (ill.). 5
comstocki, Dione vanillae* (ill.) 5
comstocki, Philotes sonorensis* (ill.) 6

*comstocki**, *Polites sabuleti* (ill.) 7
confederata, *Eurukuttarus* (ill.) 38
*coolidgei**, *Brephidium exilis* (ill.) 3
*cottlei**, *Pieris napi castoria* (ill.) 197
crispata, *Lagoa* 231
Dirphia (see *lulesa*).
Dione (see *comstocki*).
Dysodia (see *granulata*).
edwardsii, *Eurukuttarus* (ill.) 38
ethlius, *Calpodes* 273
Euchloe creusa hyantis, Life history 65
Euphydryas (see *omniluteofuscus*, *hemiluteofuscus*, *oslari*, *magdelenae*).
Eurukuttarus (see *edwardsii*, *polingi*, *confederata*).
eurytion, *Melitaea* 119
fumosa, *Hyaloscotes* (ill.) .. 161
Galasa (see *rubidana*).
Glaucopsyche (see *huguenini*).
glaucus, *Papilio* 160
gloverii, *Platoecticus* (ill.). 37
*gorgonioi**, *Phaedrotes* (ill.) 4
granulata, *Dysodia* 273
*hemiluteofuscus**, *Euphydryas chalcedona* (ill.) 195
Heodes (see *coloradensis*).
*huguenini**, *Glaucopsyche xerces* (ill.) 3
Hyaloscotes 163
(see also *fumosa*.)
hyantis, *Euchloe creusa* 65
Information wanted on Papilio 185
iole, *Nathalis* 86
Junonia (see *schraderi*).
Lagoa crispata, Poison apparatus 231
Leptotes (see *violacea*).
Live cocoons wanted 274
loki, *Strymon* 26
*lulesa**, *Dirphia* 25
*magdelenae**, *Euphydryas sierra* (ill.) 197
*malcolmi**, *Plebeius monticola* (ill.) 195
*massachusettensis**, *Vanessa virginiensis* (ill.) 198
Melitaea (see *eurytion*, *calydon*).
Nathalis (see *iole*).
*newcombi**, *Zerene eurydice* (ill.) 4
Omitted names from recent lists 118
*omniluteofuscus**, *Euphydryas chalcedona* (ill.) 195
Ormiscodes (see *schreiteri*).
*oslari**, *Euphydryas anicia capella* (ill.) 196
*pallida**, *Plebeius monticola* (ill.) 3
Papilio (see *turnus*, *glaucus*, *troilus cocklei*).
Phaedrotes (see *gorgonioi*).
Philotes (see *baldyensis*, *comstocki*).
Pieris (see *cottlei*).
Platoecticus (see *gloverii*).
Plebeius (see *malcolmi*, *pallida*).
Poison apparatus of *Lagoa crispata* 231
*polingi**, *Atrytonopsis edwardsi* (ill.) 195
polingi, *Eurukuttarus* (ill.) .. 39
Polites (see *comstocki*).
Priority confusion, Avoiding name 276
Psyche (see *carbonaria*).
Rhabdoides (see *aereofuscus*).
ridingsella, *Adela* 116
rubidana, *Galasa* 128
*schraderi**, *Junonia coenia* (ill.) 199
*schreiteri**, *Ormiscodes* 25
Silk worm cocoons wanted.. 274

*sternitzkyi**, *Anthocharis sara* (ill.) 4
Tinea (see *biselliella*).
*tollandensis**, *Brenthis* 44
troilus, *Papilio* 185
turnus, *Papilio* 128
Vanessa (see *massachusettensis*).
*violacea**, *Leptotes marina* (ill.) 6
whitneyi, *Catocala* 267
Zerene (see *newcombi*).

MYRIAPODA.

*Kesubius** 120
Lithobiomorphous chilopod .. 120
*syntheticus**, *Kesubius* 120

NEUROPTEROIDS.

Acroneuria (see *trijuncta*).
Aquatic neuropteroid insects. 110
basalis, *Choroterpes* 113
bilineata, *Hexagenia* 112
brasiliensis, *Syntermes* 294
Caenis (see *diminuta*).
castaneus, *Neotermes* (ill.) .. 291
Chauliodes (see *pectinicornis*, *serricornis*).
Choroterpes (see *basalis*).
Climacia (see *dictyona*).
dictyona, *Climacia* 116
diminuta, *Caenis* 113
Ephemera (see *simulans*).
grandis, *Syntermes* 294
Heptagenia (see *interpunctata*, *pulchella*).
Hexagenia (see *bilineata*).
infumata, *Sialis* 115
interpunctata, *Heptagenia* 113
Leptophlebia (see *mollis*).
Leucotermes (see *tenuis*).
mollis, *Leptophlebia* 112
nasutus, *Rhinotermes* 293
Neotermes (see *castaneus*).
pectinicornis, *Chauliodes* 115
pulchella, *Heptagenia* 113
Rhinotermes (see *nasutus*).
serricornis, *Chauliodes* 115
Sialis (see *infumata*).
simulans, *Ephemera* 112
Syntermes (see *grandis*, *brasiliensis*).
tenuis, *Leucotermes* 293
Termites injurious to guava tree (ill.) 288
trijuncta, *Acroneuria* 111

ODONATA.

Argia (see *violacea*).
Basiaeschna (see *janata*).
brevistylus, *Hagenius* 114
carunculatum, *Enallagma* 115
corruptum, *Sympetrum* 77
Coryphaeschna (see *ingens*).
cynosura, *Tetragoneuria* 115
Didymops (see *transversa*).
ebrium, *Enallagma* 115
Enallagma (see *carunculatum*, *ebrium*, *pictum*).
exilis, *Gomphus* 114
Gomphus (see *exilis*, *plagiatus*).
Hagenius (see *brevistylus*).
illinoiensis, *Macromia* 114
ingens, *Coryphaeschna* 85
janata, *Basiaeschna* 114
Macromia (see *illinoiensis*).
Nasiaeschna (see *pentacantha*).
Neurocordulia (see *obsoleta*).
Notes from North Carolina .. 85
obsoleta, *Neurocordulia* 115
pentacantha, *Nasiaeschna* ... 85
pictum, *Enallagma* 85
plagiatus, *Gomphus* 114
Predatorial capacity 77
semicinctum, *Sympetrum* 115
Sympetrum (see *corruptum*, *semicinctum*).
Tetragoneuria (see *cynosura*).
transversa, *Didymops* 115
violacea, *Argia* 115

ORTHOPTERA.

Acrididae 168
auricularia, Forficula 234
Earwigs, Study of 234
Forficula (see *auricularia*).
Melanoplus (see *stonei*).
Melanoplus femur-rubrum swarming 317
stonei, Melanoplus 168

SIPHONAPTERA.

*Actenophthalmus** 121
Ctenophthalmus (see *heiseri*).
heiseri, Ctenophthalmus 121

THYSANOPTERA.

Anaphothrips (see *decolor*).
decolor, Anaphothrips* 101
distalis, Haplothrips* 103
dracaenae, Parthenothrips (ill.) 182
Eurythrips (see *harti*).
Haplothrips (see *purpuratus, distalis*).
harti, Eurythrips* 135
impar, Thrips 183
jacksoni, Oedaleothrips* 137
Liothrips (see *vaneeckei*).
Notes on little known thrips 180
Oedaleothrips (see *jacksoni*).
orionis, Taeniothrips 180
Parthenothrips (see *dracaenae*).
piger, Rhynchothrips* 134
purpuratus, Haplothrips* 101
Rhynchothrips (see *piger*).
Taeniothrips (see *orionis*).
Thrips (see *impar*).
vaneeckei, Liothrips 180

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Wanted—Correspondence with collectors desiring to make a trip to South America to collect with me as a companion. Write—A. F. Porter, Decorah, Iowa.

E. A. Dodge of 546 Bay St., Santa Cruz, California, would be pleased to exchange with other W. S. Lepidopterists.

Wanted—Macrolepidoptera (first quality only, in papers) and living pupae from all countries in exchange for European material. Herbert Noack, Mathildenplatz 8, Darmstadt, Germany.

Will send volumes XXV (1921) and XXVII (1923), Revista Chilena de Historia Natural, in exchange for School Entomology by Sanderson & Peairs and Classbook of Economic Entomology by Wm. Lochhead (latest editions) sent to me by registered mail. Will give vol. XXXV also for a copy of American Insects by V. L. Kellogg (last edition) sent registered. Prof. Dr. C. E. Porter, Casilla 2974, Santiago, Chile.

For Exchange—A fine collection of butterflies of the Indian region, 1300 species, including many rarities. Apply to Dr. C. F. C. Beeson, Forest Research Institute, Dehra Dun, India.

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Wanted to buy or exchange **Named** American Chrysids and Ruby Wasps. Mortimer L. J. Higgins, 36 Imlay St., Hartford, Connecticut.

I wish to exchange butterflies with collectors in the United States.—V. W. A. Moller, Frederick St., Taninga, Brisbane, Australia.

Wanted—Canadian Entomologist, Vol. 2 (1869) to 9 (1877); Vol. 12 (1879); Nos. 5, 9 of Vol. 17 (1885); No. 3 of Vol. 18 (1886); Vol. 19 (1887); Zoe, No. 12 of Vol. 5; Proc. Ent. Soc. Washington, Vol. 1 (1899) to 5 (1903); all in exchange for **Cetonides** and **Longicorns** from New Guinea or other countries. Also entom. literature could be given. Address Deutsches Entom. Institut (Walther Horn), Gossler Str. 20, Berlin-Dahlem, Germany.

Wanted for cash all kinds of hibern. pupae, such as P. troilus, rutulus, daunus, zolicaon, eurymedon, etc., A. orizaba, jorulla, S. columbia, californica, C. angulifera, A. luna, E. imperialis, C. regalis, also Sphingidae, etc. Send list with prices to Max Rothke, Scranton, Pa. (R. F. D. No. 2).

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COLEOPTERA.

874.—**Brisley** (H. R.).—Notes on the Chrysomelidae of Arizona. (Trans., 51, 167-182, 1925)..... .35

DIPTERA.

870.—**Painter** (R. H.).—A review of the genus Lepidophora (Bombyliidae). (Trans., 51, 199-127, ill., 1925)..... .20

HYMENOPTERA

869.—**Bequaert** (J.).—The genus Ancistrocerus (Vespidae) in North America, with a partial key to the species. (Trans., 51, 57-117, 1925)..... 1.25

871.—**Compere** (H.).—A new genus and species of Aphelinidae from China. (Trans., 51, 129-134, 2 pls., 1925)..... .20

872.—**Viereck** (H. L.).—A new bee of the genus Andrena [from Nevada]. (Trans., 51, 135-136, 1925)..... .20

873.—**Frison** (T. H.).—Contribution to the classification of the Bremidae of Central and South America. (Trans., 51, 137-165, 2 pls., 1925)..... .65

LEPIDOPTERA.

865.—**Braun** (A. F.).—Some undescribed microlepidoptera and notes on life histories. (Trans., 51, 13-17, 1925)..... .20

867.—**Coolidge** (K. R.).—The life history of Danaus bernice strigosa (Danaidae). (Trans., 51, 27-33, 1925)..... .20

ORTHOPTERA.

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